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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air).*

15 LAUNCH VEHICLES AND SPACE VEHICLES 1436

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 1438

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

17 SPACECRAFT COMMUNICATION, COMMAND AND TRACKING N.A.

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 1438

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

19 SPACECRAFT INSTRUMENTATION N.A.

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 SPACECRAFT PROPULSION AND POWER 1450

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) 1451
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 1451
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 1453
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 1458
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 1464
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 1469
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics.*

31 ENGINEERING (GENERAL) 1471
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 1473
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 1484
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 1490
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY 1497
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 1500
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 1501
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 1503
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 1505
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) 1519

43 EARTH RESOURCES 1520
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION 1528
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

45 ENVIRONMENT POLLUTION 1531
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 1533
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY 1539
Includes weather forecasting and modification.

48 OCEANOGRAPHY 1543
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) **1543**
Includes genetics.

52 AEROSPACE MEDICINE **1546**
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES **1549**
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT **1552**
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY **N.A.**
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) **1556**

60 COMPUTER OPERATIONS AND HARDWARE **1556**
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE **1558**
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS **1566**
Includes computer networks.

63 CYBERNETICS **1567**
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS **1568**
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY **1573**
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS **1574**
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS **1574**
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering*.

70 PHYSICS (GENERAL) **1574**
For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar Physics*.

71 ACOUSTICS **1575**
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution*.

72 ATOMIC AND MOLECULAR PHYSICS **1576**
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS **1577**
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation*.

74 OPTICS **1578**
Includes light phenomena.

75 PLASMA PHYSICS **1580**
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

76 SOLID-STATE PHYSICS **1587**
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 THERMODYNAMICS AND STATISTICAL PHYSICS **1590**
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) **N.A.**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **1591**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE **1592**
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS **1593**
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE **N.A.**
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **1594**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **N.A.**

89 ASTRONOMY **1594**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **1595**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1596**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1596**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **1597**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **1598**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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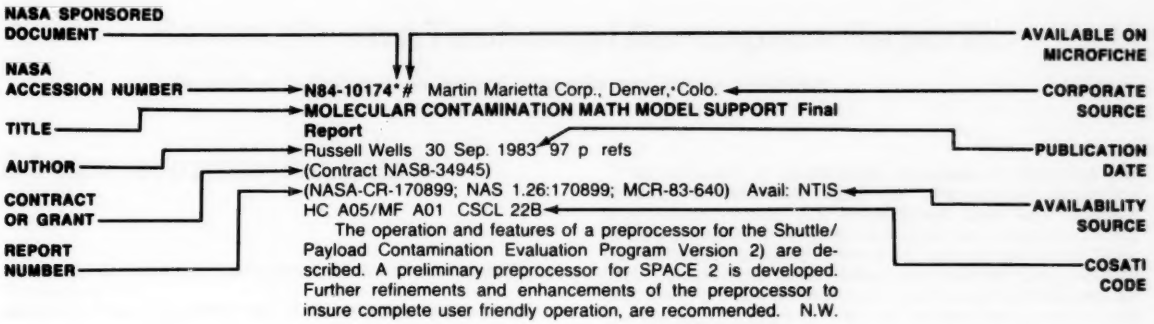
REPORT/ACCESSION NUMBER INDEX **I-93**

TYPICAL CITATION AND ABSTRACT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N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS HC A05/MF A01 CSCL 22B
The operation and features of a preprocessor for the Shuttle/Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

VOLUME 22 NUMBER 10/MAY 23, 1984

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N84-19279*# National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING, A CONTINUING BIBLIOGRAPHY WITH INDEXES
Feb. 1984 148 p
(NASA-SP-7037(171); NAS 1.21:7037(171)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 567 reports, articles and other documents introduced into the NASA scientific and technical information system in January 1984. M.A.C.

N84-19280# Naval Postgraduate School, Monterey, Calif.
A MULTI-PERIOD REPAIR PARTS INVENTORY MODEL FOR A NAVAL AIR REWORK FACILITY M.S. Thesis
A. S. Asselin Sep. 1983 71 p
(AD-A136873) Avail: NTIS HC A04/MF A01 CSCL 15/5

A ready supply store (RSS) containing repair parts which are anticipated to be used during the production process has been established to support the naval air rework facility (NARF). While this supporting inventory was previously constructed using historical demand data, a single period model and a two-period model have been proposed which compute stock levels based on quarterly production schedules. This thesis extends the use of the projected production information in calculating RSS inventory levels from two periods to multiple periods. The disadvantage of the single period model is that it ignores information about future schedules. The multiperiod model uses the information on future schedules to behave more optimally. The multi-period model shows significant differences in inventory levels over the single-period model as a result of the added information. The multi-period model is also easily programmed on a computer and is preferred over the single-period model. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-19281*# Boeing Commercial Airplane Co., Seattle, Wash.
AN ANALYSIS OF PROP-FAN/AIRFRAME AERODYNAMIC INTEGRATION Final Report
M. L. Boctor, C. W. Clay, and C. F. Watson Oct. 1978 74 p refs
(Contract NAS2-9104)
(NASA-CR-152186; NAS 1.26:152186; D6-47113) Avail: NTIS HC A04/MF A01 CSCL 01A

An approach to aerodynamic integration of turboprops and airframes, with emphasis placed upon wing mounted installations is addressed. Potential flow analytical techniques were employed to study aerodynamic integration of the prop fan propulsion concept with advanced, subsonic, commercial transport airframes. Three basic configurations were defined and analyzed: wing mounted prop fan at a cruise Mach number of 0.8, wing mounted prop fan in a low speed configuration, and aft mounted prop fan at a cruise Mach number of 0.8. Author

N84-19282*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DELTA WINGS WITH SHOCK-FREE CROSS FLOW Final Report
S. S. Sritharan Feb. 1984 27 p refs
(Contract NAS1-17070)
(NASA-CR-172297; NAS 1.26:172297; Rept-84-6) Avail: NTIS HC A03/MF A01 CSCL 01A

In order to have a high level of maneuverability, supersonic delta wings should have a cross flow that is free of embedded shock waves. The conical cross flow sonic surface differs from that of plane transonic flow in many aspects. Well-known properties such as the monotone law are not true for conical cross flow sonic surfaces. By using a local analysis of the cross flow sonic line, relevant conditions for smooth cross flow are obtained. A technique to artificially construct a smooth sonic surface and an efficient numerical method to calculate the flow field are used to obtain cones with smooth cross flow. A.R.H.

N84-19283*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
FLOWFIELD MEASUREMENTS IN A MODEL SCRAMJET COMBUSTION USING LASER-INDUCED IODINE FLUORESCENCE Semiannual Progress Report, 1 Jul. 1983 - 1 Jan. 1984
James C. McDaniel, Jr. Mar. 1984 19 p
(Grant NAG1-173)
(NASA-CR-175399; NAS 1.26:175399; UVA/528228/MAE84/101) Avail: NTIS HC A02/MF A01 CSCL 01A

Preliminary designs were completed for an iodine mixing chamber and the optical setup to be used with a modified wind tunnel in obtaining accurate, spatially resolved measurements of variables in the flowfield of a model nonreacting scramjet combustor. Schematics of the iodine-seeded wind tunnel and a sketch of the charcoal filter for removing the iodine are included along with a cutaway section of the laboratory. A.R.H.

N84-19284*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
AN ANALYTICAL DESIGN PROCEDURE FOR THE DETERMINATION OF EFFECTIVE LEADING EDGE EXTENSIONS ON THICK DELTA WINGS Final Report
Farhad Ghaffari and Sushil K. Chaturvedi Feb. 1984 83 p refs
(Contract NAS1-17099)
(NASA-CR-175395; NAS 1.26:175395) Avail: NTIS HC A05/MF A01 CSCL 01A

An analytical design procedure for leading edge extensions

(LEE) was developed for thick delta wings. This LEE device is designed to be mounted to a wing along the pseudo-stagnation stream surface associated with the attached flow design lift coefficient of greater than zero. The intended purpose of this device is to improve the aerodynamic performance of high subsonic and low supersonic aircraft at incidences above that of attached flow design lift coefficient, by using a vortex system emanating along the leading edges of the device. The low pressure associated with these vortices would act on the LEE upper surface and the forward facing area at the wing leading edges, providing an additional lift and effective leading edge thrust recovery. The first application of this technique was to a thick, round edged, twisted and cambered wing of approximately triangular planform having a sweep of 58 deg and aspect ratio of 2.30. The panel aerodynamics and vortex lattice method with suction analogy computer codes were employed to determine the pseudo-stagnation stream surface and an optimized LEE planform shape. Author

N84-19285*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON THE STABILITY OF AN INFINITE SWEPT ATTACHMENT LINE BOUNDARY LAYER Final Report
P. Hall (Imperial College), M. R. Mallik (High Technology Corp.), and D. I. A. Poll (Cranfield Inst. of Technology) Feb. 1984 46 p refs
(Contracts NAS1-17070; NAS1-16916; NAS1-14605)
(NASA-CR-172300; ICASE-84-5; NAS 1.26:172300) Avail: NTIS HC A03/MF A01 CSCL 01A

The instability of an infinite swept attachment line boundary layer is considered in the linear regime. The basic three dimensional flow is shown to be susceptible to travelling wave disturbances which propagate along the attachment line. The effect of suction on the instability is discussed and the results suggest that the attachment line boundary layer on a swept wing can be significantly stabilized by extremely small amounts of suction. The results obtained are in excellent agreement with the available experimental observations. Author

N84-19286*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONVERGENCE OF GENERALIZED MUSCL SCHEMES Final Report
Stanley Osher (California Univ.) Feb. 1984 36 p refs
(Contract NAS1-17070; Grants NAG1-270; NSF MCS-82-00788; DAAG29-82-K-0090)
(NASA-CR-172306; ICASE-84-10; NAS 1.26:172306) Avail: NTIS HC A03/MF A01 CSCL 01A

Semi-discrete generalizations of the second order extension of Godunov's scheme, known as the MUSCL scheme, are constructed, starting with any three point E scheme. They are used to approximate scalar conservation laws in one space dimension. For convex conservation laws, each member of a wide class is proven to be a convergent approximation to the correct physical solution. Comparison with another class of high resolution convergent schemes is made. Author

N84-19287*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TESTS OF A NACA 65(SUB 1)-213 AIRFOIL IN THE NASA LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL
E. B. Plentovich, Charles L. Ladson, and Acquilla S. Hill Feb. 1984 99 p
(NASA-TM-85732; NAS 1.15:85732) Avail: NTIS HC A05/MF A01 CSCL 01A

A wind-tunnel investigation was conducted to study the two dimensional aerodynamic characteristics of the NACA 65 sub 1-213 airfoil over a wide range of Reynolds numbers. Test temperature ranged from ambient to about 100K at pressures ranging from about 1.2 to 6.0 atm. Mach number was varied from 0.22 to 0.80 and Reynolds number (based on airfoil chord) from 3 million to 40 million. Data are included which demonstrate the effects of fixed transition, Mach number, and Reynolds number on the aerodynamic characteristics of the airfoil. A sample of data showing the effects of angle of attack on the pressure distribution is also given. The data are presented in an uncorrected form with no analysis. S.L.

N84-19288# Naval Postgraduate School, Monterey, Calif.
EXPERIMENTAL DETERMINATION OF THE RELATIVE FLOW AT THE TIP OF A TRANSONIC AXIAL COMPRESSOR ROTOR Engineers Thesis
D. W. Cornell Sep. 1983 224 p
(AD-A137483) Avail: NTIS HC A10/MF A01 CSCL 20/4

The goal in the present work was to examine the flow through the tip section of a transonic compressor rotor in three different ways: (1) using high response instrumentation in the compressor itself, (2) using a blow-down wind tunnel model of the relative flow at the rotor tip, and (3) using a new computer analysis code. Toward that goal, the present study reports the results of extensive measurements made in the compressor and software developed to acquire and reduce high response transducer data. Modifications made to the cascade and first results of applying S. Eidelman's Godunov code to the compressor rotor tip section are also included. It was concluded that a valid comparison of computed and measured results required both an improvement of the compressor in-flow and an extension of the analysis code to include three dimensional effects. Author (GRA)

N84-19289# Ballistic Research Labs., Aberdeen Proving Ground, Md.
NUMERICAL INVESTIGATION OF THE AERODYNAMICS AND STABILITY OF A FLARED AFTERBODY FOR AXISYMMETRIC PROJECTILES AT SUPERSONIC SPEEDS Final Report
Michael J. Nuscua Dec. 1983 56 p
(DA Proj. 1L1-62618-AH-80)
(AD-A136826; AD-F300363; ARBRL-TR-02535) Avail: NTIS HC A04/MF A01 CSCL 19/1

A parametric study has been conducted for eight similar axisymmetric, spin stabilized projectile shapes. The aerodynamic and stability parameters of flared projectile afterbodies at freestream Mach numbers of 2, 3 and 4 and at an angle of attack of 2 deg have been determined. The projectiles under investigation has an ogive nose, a cylindrical midsection and one of three afterbodies: an extended cylinder, a boattail (conical frustum), and a boattail-flare (two conical frustums end to end). Total projectile lengths of 6 and 7 calibers have been studied. Finite difference solutions of the Navier-Stokes equations, the method of characteristics, and semi-empirical models are used to predict normal force, static pitching moment, total drag, Magnus moment, roll damping and pitch damping. Estimations of gyroscopic and dynamic stability parameters are then made. This study determined that the boattail-flare renders the ogive nose and cylindrical midsection projectile configuration more gyroscopically and dynamically stable than the conventional boattail afterbody. Results also showed that the boattail-flare afterbody decreases the Magnus moment but increases total drag therefore providing a stability advantage at the expense of reduced range. This stability advantage can be utilized in long spin-stabilized projectiles as well as long rod penetrators where fin stabilization has been replaced by a boattail-flare. Future work may be aimed at utilizing present computational techniques as a design tool in the use of a flared afterbody for stable, reduced range projectiles. GRA

N84-19290# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A STUDY OF THE AERODYNAMIC INTERFERENCE EFFECTS DURING AERIAL REFUELING M.S. Thesis
E. H. Hoganson Dec. 1983 100 p
(AD-A136895; AFIT/GAE/AA/83D-8) Avail: NTIS HC A05/MF A01 CSCL 20/4

This report investigated the feasibility of using an analytical approach and the vortex lattice method (VLM) to evaluate aerodynamic interference effects present during aerial refueling. While KC-10 tanker and a B-52 receiver were studied, the method applies to any tanker receiver combination. Major assumptions include: linear potential flow; tanker receiver are represented by

wing planforms; fuselage effects are small; and the rolling-up process of the tanker's wing tip vortices are not considered. The analytical approach uses a lifting line followed by a semi-infinite vortex sheet to represent the tanker. Three linear lift distributions for the tanker's wing were used and equations were derived for the induced downwash at any point in space. Points on the receiver's wing were selected to indicate the tanker's effect on the receiver's flowfield. Results of the analytical equations when compared with analytical predictions were found to overpredict the induced downwash by 25-35%. VLM was used to study the effects of: rectangular vs swept wings on induced downwash; tanker tailplane on the receiver; change of angle of attack of one aircraft due to the presence of the other; and the presence of the tanker on th receiver's pitching moment. VLM results varied from the Douglas prediction for induced downwash by only 5% and were even more accurate at lower tanker angles of attack. GRA

N84-19291# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INVESTIGATION OF EFFECTS CONTRIBUTING TO DYNAMIC STALL USING A MOMENTUM-INTEGRAL METHOD M.S. Thesis
J. S. Lawrence Dec. 1983 108 p
(AD-A136897; AFIT/GAE/AA/83D-12) Avail: NTIS HC A06/MF A01 CSCL 20/4

Dynamic stall effects are analyzed in this investigation for cases of an inertially static airfoil in a flow field rotating at constant rate (gust response), and an airfoil pitching at constant rate in a steady flow field. The method used is a boundary layer solution of the momentum-integral equation by a modified von Karman-Pohlhausen technique. Previous work using this method to match Kramer's experimental results for gust response is reviewed, corrected, and continued. The validity of the closure equation and the assumptions key to its derivation are examined, concluding that the closure equation is justified. A better match of Kramer's airfoil sections results in dynamic stall predictions very close to experimental data. The effect of varying airfoil thickness and camber is investigated. By consideration of the non-Newtonian motion of the boundary layer on the surface of a pitching airfoil, the momentum-integral method is extended to the second case. Using the Moore-Rott-Sears model for flow separation criteria, analytical results were computed and compared with experimental data. Reduction in adversity of the pressure gradient accounts for only a fraction of the total dynamic effect, and it is proposed that mass introduction into the boundary layer from the free stream may be a strongly contributing factor. This phenomena is demonstrated to have a large effect, and an argument is presented for the proper amount of mass introduction. GRA

N84-19292# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A WIND TUNNEL INVESTIGATION TO DETERMINE DOMINANT FOREBODY STRAKE DESIGN CHARACTERISTICS FOR AN F-15 EQUIPPED WITH CONFORMAL FUEL TANKS M.S. Thesis
T. A. Duncan Dec. 1983 127 p
(AD-A136912; AFIT/GAE/AA/83D-7) Avail: NTIS HC A07/MF A01 CSCL 20/4

A parametric study was made in the AFIT 5-ft wind tunnel of forebody strakes on an F-15C model equipped with conformal fuel tanks. Parameters of interest were strake planform area and strake angle of incidence. Twenty configurations were evaluated for longitudinal and lateral stability at angles of attack from -4 to 46 deg. Lift coefficient, drag coefficient, and pitching moment coefficient (CM) were plotted angle of attack (alpha). Data indicated that an excessive positive increase in the derivative of CM/ derivative of alpha can be expected at angles of attack of 20 deg or less. Above 20 deg, CM may be tailored by varying the strake area and incidence angle. For each strake examined, and angle of incidence of either -3 or -6 deg (depending on planform area) produced a more nearly linear CM vs alpha curve than 0 degrees; therefore, incidence angle should be considered in strake design optimization. Lateral stability data were taken on 12 configurations from 16 to 44 deg angle of attack. To determine spin susceptibility, the parameter for predicting lateral-directional stability was plotted for the most promising configurations. Very little constructive change in lateral stability was noted for the configurations tested. GRA

N84-19293# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE EFFECT OF CONSTANT VERSUS OSCILLATORY RATES ON DYNAMIC STABILITY DERIVATIVES M.S. Thesis
M. S. Larson Dec. 1983 101 p
(AD-A136913; AFIT/GAE/ENY/83D-11) Avail: NTIS HC A06/MF A01 CSCL 20/4

The purpose of this thesis was to determine whether or not there are phenomenological differences between dynamic derivations calculated from F-15A rotary balance data and data from other sources. To make this determination, two additional data sets were obtained: (1) the F-15A design phase stability derivative data, and (2) the F-15A production phase stability derivative data. The lateral dynamic derivatives were then compared through derivatives of the lateral moments with respect to the rotation rate about the velocity vector (wind vector). The conclusion of the project was that differences exist between the data sets, but that the dominant characteristics were the same for all of the data sets; the differences in the data were not indicative of basic (phenomenological) the differences in the data itself. Therefore, the contention that oscillatory rates affect determination of the dynamic derivations was not substantiated by this study.
Author (GRA)

N84-19294# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CONTINUED EXPERIMENTAL INVESTIGATION OF DYNAMIC STALL M.S. Thesis
S. J. Schreck Dec. 1983 147 p
(AD-A136920; AFIT/GAE/AA/83D-21) Avail: NTIS HC A07/MF A01 CSCL 20/4

Flow over an NACA 0015 airfoil undergoing a constant rate of change of angle of attack was experimentally studied over a range of tunnel speeds and rotation rates. Surface pressure transducers coupled with a microcomputer-based data acquisition system were used to collect surface-pressure data at the rate of 4000 samples per second; data reduction was also microcomputer-based. Data was reduced in two forms: (1) C sub l versus alpha curves through stall were determined for each dynamic experimental configuration. This was accomplished by numerical integration of pressure data at a number of angles through stall, each data point representing the average of five experiments at the same experimental conditions. These curves indicated a slight decrease in C sub l - alpha slope with increasing angle of attack angular rate. (2) Increase in stall angle of attack of the dynamic over the static case was plotted against a nondimensional angular rate parameter (defined as the product of one-half the chord length and angular rotation rate, divided by the freestream velocity). This comparison gave rise to an apparently universal curve of nondimensional angular rotation rate versus increase in stall angle of attack. This curve was in agreement in some sense with previous experiments using stall indicators other than the actual stall. GRA

N84-19295# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE EFFECT OF TRAILING VORTICES ON THE PRODUCTION OF LIFT ON AN AIRFOIL UNDERGOING A CONSTANT RATE OF CHANGE OF ANGLE OF ATTACK M.S. Thesis
K. W. Tupper Dec. 1983 81 p
(AD-A136921; AFIT/GAE/AA/83D-24) Avail: NTIS HC A05/MF A01 CSCL 20/4

The purpose of this study was to investigate the effect a trailing vortex wake has on an airfoil undergoing a constant rate of change of angle of attack, alpha, in two dimensional, incompressible, irrotational flow. Potential flow theory, conformal mapping by the Joukowski transformation, and numerical integration and differentiation techniques were used to develop a computer algorithm to model the problem. Once the program was formulated,

it was used to solve the impulsive-start problem of airfoil motion. The results were found to be in excellent agreement with the results obtained by others. When applied to the constant rate-of-change of angle-of-attack problem, the results showed that a trailing vortex wake has a measurable and predictable effect on the production of lift on an airfoil undergoing a constant alpha. While results of this work, taken alone, are helpful in understanding the phenomena known as dynamic stall, coupled with existing boundary-layer studies the results may lead to additional understanding of the phenomena. More specifically, the computer program developed here could be used to predict more realistically the inviscid flow about a pitching airfoil as it approaches the dynamic-stall conditions. GRA

N84-19296# Naval Ship Research and Development Center, Bethesda, Md.

A TIME DOMAIN ANALYSIS OF A RIGID TWO-BLADED FULLY GIMBALLED HELICOPTER ROTOR WITH CIRCULATION CONTROL Final Report

P. S. Montana Dec. 1983 88 p
(ZR0-2302)
(AD-A136947; AD-E001638; DTNSRDC-83/081; AERO-1282) Avail: NTIS HC A05/MF A01 CSCL 20/4

An analytic investigation was made to determine the dynamic properties of a two-bladed rigid fully gimballed helicopter rotor incorporating circulation control airfoils and tip jet propulsion. A time domain analysis was developed which provided the capability of using nonlinear airfoil aerodynamics and arbitrary rotor physical characteristics. The effects of feather principal axis of inertia location, horizontal gust disturbances, and feedback control on rotor stability were assessed. Results of the investigation indicate that the subject helicopter rotors are unstable in forward flight without feedback control. With feedback, the rotors are stable and controllable. Author (GRA)

N84-19297# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

AN INVESTIGATION OF NEW POSSIBILITIES TO SIMPLIFY THE STANDARD SUPERSONIC AREA RULE M.S. Thesis

Vojin Rade Nikolic Dec. 1983 101 p
(AD-A137018; AD-E750174; AFIT/GAE/AA/83D-16) Avail: NTIS HC A06/MF A01 CSCL 20/4

An investigation was conducted to find out whether there are possibilities to construct a procedure capable of giving reasonably accurate results for the aircraft wave drag coefficient over a range of Mach numbers or, at least, to predict the wave drag changes due to configuration changes. The idea was to build an algorithm starting from the standard supersonic area rule but employing different definitions for the area distribution along the longitudinal axis as applied to the equivalant body of revolution. Instead of using the set of planes tangent to the characteristic Mach cones, lateral surfaces of the cones were used. A computer program to perform the calculations following the procedure proposed was written. Several aircraft configurations were investigated by employing the developed method and very promising results for a particular type of supersonic aircraft configuration at moderate supersonic speeds were obtained. When applied to predict the wave drag of a configuration employing a thin wing of small aspect ratio centrally mounted on a slender fuselage at Mach numbers between 1.4 and 2.0, the method gave results within a range of ten percent accuracy. GRA

N84-19298# United Technologies Research Center, East Hartford, Conn.

ANALYSIS OF TRANSONIC SHOCK INDUCED SEPARATED FLOW INCLUDING NORMAL PRESSURE GRADIENTS Final Report, Apr. 1982 - 31 Aug. 1983

J. E. Carter, D. E. Edwards, and M. M. Hafez Oct. 1983 108 p
(Contract F49620-81-C-0041; AF Proj. 2307)
(AD-A137052; UTRC/R83-915712-2; AFOSR-83-1283TR) Avail: NTIS HC A06/MF A01 CSCL 20/4

An analysis based on a two-layer interaction model is presented for the prediction of transonic shock-wave, boundary-layer interaction with emphasis on turbulent separated flow. In this analysis finite difference techniques are used to solve the viscous layer equations, expressed in a defect form, and the stream function-vorticity representation of the inviscid flow. A global technique is used to iteratively solve these coupled sets of equations. Normal pressure gradients and imbedded shock effects are included in the analysis. Two major conclusions can be drawn from the present work: First, favorable comparisons obtained with the separated data of Kooi (Mach no. = 1.4) demonstrate that the present analysis is capable of accurately resolving many of the transonic shock-wave, boundary-layer interaction. Second, these results show that, for transonic shock induced separation, the effect of displacement thickness interaction dominates over that produced by imbedded shock effects and normal pressure gradients. Calculations made with a modified algebraic turbulence model demonstrate that for separated cases the computed results are more sensitive to the turbulence model than to whether or not normal pressure gradients are included. GRA

N84-19299# Montana State Univ., Bozeman. Dept. of Mechanical Engineering.

THE HYDRODYNAMIC STABILITY OF A SUPERSONIC LAMINAR BOUNDARY LAYER OVER A ROUGH WALL Annual Report, 1 Oct. 1982 - 30 Sep. 1983

A. Demetriades Oct. 1983 14 p
(Grant AF-AFOSR-0267-80; AF Proj. 2307)
(AD-A137056; AFOSR-83-1287TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

The purpose of this research is to see how surface roughness affects the hydrodynamic stability of a supersonic laminar boundary layer. The outcome of the first year of the program had been: (1) to demonstrate the great resistance of the supersonic flow to destabilization and tripping by roughness; (2) to choose a final roughness capable of such destabilization and tripping; and (3) to complete boundary layer surveys on an axisymmetric body so roughened as a prerequisite to the stability measurements. In the present report period the geometry was changed to a planar (flat plate) one to correct deficiencies found in the axisymmetric flow which, however, uses the same roughness geometry as before. The flow field measurements on this model have been completed, as have about 30% of the final stability measurements. GRA

N84-19300# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.

SOME UNSTEADY AERODYNAMIC CHARACTERISTICS OF SEPARATED AND ATTACHED FLOW Annual Report, 1 Sep. 1982 - 31 Sep. 1983

E. E. Covert, P. F. Lorber, and C. M. Vaczy 31 Aug. 1983 59 p
(AF Proj. 2307)
(AD-A137070; AFOSR-83-1344TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

Aerodynamic characteristics of separated and attached unsteady flow about a NACA 0012 airfoil have been measured for reduced frequency from 0 to 6.4 and angles of attack up to 18 deg. Results from boundary layer and near wake ensemble averaged velocity, Reynolds stress and surface pressure distributions are presented. The flow was determined to be locally two dimensional away from the separation point (if present), within + or - 1/4 span of the airfoil centerline. A convected component of the unsteady separated pressure field was identified, and the dependence on reduced frequency, angle of attack, Reynolds number and form of transition is discussed. A geometric similarity model is suggested to explain the presence of a periodic component measured for the ensemble averaged Reynolds stresses. Finally, studies of the relative importance of acoustic and upwash velocity components of the excitation are summarized.
Author (GRA)

N84-19301# Eidgenoessisches Flugzeugwerk, Emmen (Switzerland). Versuchs- und Forschungsanlage.

COMPARATIVE FORCE MEASUREMENTS ON HALF AND WHOLE MODELS OF A HEAVY LIFT WING IN THE LARGE WIND TUNNEL EMMEN [VERGLEICHENDE KRAFTMES-

SUNGEN AN HALB- UND GANZMODELLEN EINES HOCHAUFTRIEBSFLUEGELS IM GROSSEN WINDKANAL EMMEN]
Heini Kamber Apr. 1982 47 p refs In GERMAN Presented at DGLR Fachausschuss-Sitzung ueber Halbmodell-Versuchstech., Goettingen West Germany, 3-4 Dec. 1981
(F/W-50-1596) Avail: NTIS HC A03/MF A01

Measurements were performed on heavy lift wing models in a wind tunnel. The results show that the boundary layer plate developed for half-models agrees well with whole-models in the case of heavy lift wing flaps. This makes it possible to use the half-model technique for design and optimization of heavy lift wings. Compared to whole-model measurements Reynolds numbers are square root of 2 times higher, the accuracy is higher, and the costs are lower. The Maskell method for wake blocking wind tunnel corrections is discussed. Author (ESA)

N84-19302# Bonn Univ. (West Germany). Sonderforschungsbereich 72.
COMFLO: AN EXPERIMENTAL PROGRAM FOR MULTIGRID TREATMENT OF SUBSONIC POTENTIAL FLOWS PAST AIRFOIL PROFILES [COMFLO- EIN EXPERIMENTIERPROGRAMM ZUR MEHRGITTERBEHANDLUNG SUBSONISCHER POTENTIALSTROEMUNGEN UM TRAGFLAECHENPROFILE]
Klaus Becker Jun. 1983 134 p refs In GERMAN Submitted for publication Sponsored by Deutsche Forschungsgemeinschaft (Preprint-604) Avail: NTIS HC A07/MF A01

A test program to solve the full potential equation for subsonic flows was developed for multigrid components and the investigation of the accuracy of discretization and multigrid methods. The complete COMFLO computer program is enclosed. Author (ESA)

N84-19303# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Technische Akustik.
ON THE SIGNIFICANCE OF UNSTEADY SURFACE PRESSURES FOR AERODYNAMICALLY INDUCED INTERIOR NOISE OF AUTOMOBILES Ph.D. Thesis - Technische Univ., Berlin
Werner Dobrzynski Sep. 1983 130 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-83-28) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 30

Aerodynamically induced interior noise in passenger cars is investigated. Surface pressures and resulting interior noise were measured on a full-scale automobile in wind tunnel tests. Interior noise predictions based on theoretical interrelations were compared to measured data. It is concluded that high surface pressure originating even from highly localized flow separations on the car body tends to dominate interior noise. Farfield noise radiation from exterior flow/car-body interaction was studied and results show that a noise level reduction of 4 dB is possible.
Author (ESA)

N84-19304# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
A SURVEY OF THE CONTROL SYSTEM ANALYSIS AND SYNTHESIS PROGRAM (CASPAR) PACKAGE FOR AEROSPACE RESEARCH
J. A. Hoogstraten Feb. 1983 54 p refs
(VTH-LR-336) Avail: NTIS HC A04/MF A01

The program package CASPAR (Control system Analysis and Synthesis Program package for Aerospace Research) for the development and evaluation of linear time-invariant systems is introduced. The program package consists of independent batch-executable modules. Program use is facilitated through a set of command list programs which aid the user in preparing a job for execution. Command list program use is illustrated with an application to the design of a glide-path-hold control law for a B-747 aircraft in approach configuration. Author (ESA)

N84-19305# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
WIND TUNNEL TESTS ON AN OUTER WING SEGMENT OF THE ASW-19X SAILPLANE
L. M. M. Boermans and B. Oolbekking Jan. 1983 24 p refs
(VTH-LR-369) Avail: NTIS HC A02/MF A01

The aerodynamic characteristics of an outer wing segment of the ASW-19X sailplane were studied using airfoils designed so that by adding material to the surface the existing wing could be modified and tested in flight. Pneumatic turbulators were put on the lower surface. Wind tunnel tests on the inner wing airfoil section show a considerable drag decrease, and similar tests on an outer wing segment are described. Tests with a tape with bumps instead of the pneumatic turbulators are described. Wool tufts filmed by a camera mounted on a sting on top of the fuselage indicate flow separation on the downward deflected aileron in circling flight.
Author (ESA)

N84-19306 Georgia Inst. of Tech., Atlanta.
TURBULENCE GENERATED PRESSURE FLUCTUATIONS IN A CLASS OF INTERIOR FLOWS Ph.D. Thesis
Uday Gajanan Hegde 1983 168 p
Avail: Univ. Microfilms Order No. DA8327334

The present investigation was motivated by vibration and instability problems in solid propellant rocket motors. A class of interior flows modelled to simulate flow conditions inside rocket motor cavities was considered. The turbulence generated pressure fluctuations were shown to consist of two components--acoustic and hydrodynamic. A theory of aeroacoustics was employed to extract acoustic pressure spectra from experimentally obtained turbulence data and acoustic impedance values at flow boundaries. The effects of turbulence intensities, sidewall acoustic impedance, axial mass blowing distribution, length to diameter ratio of the cavity and different mass flux on the acoustic pressure level were investigated in experimental configurations. Typical pressure levels inside rocket motor environments were calculated utilizing a particular representation for propellant response. Estimates of the hydrodynamic component of the pressure fluctuations are provided for the case of fully developed turbulent pipe flow. Dissert. Abstr.

N84-19905# McDonnell-Douglas Corp., St. Louis, Mo.
TESTING FOR SEVERE AERODYNAMICALLY INDUCED VIBRATION ENVIRONMENTS
H. N. Roos and G. R. Waymon *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 155-159 ref (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01/1

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-19307# European Space Agency, Paris (France).
DEVELOPMENTAL POSSIBILITIES AND RESTRICTIONS IN AIR TRANSPORT
Oct. 1983 96 p Transl. into ENGLISH of proceedings of the Entwicklungsmoeglichkeiten u. Restriktionen im Luftverkehr Forum, rept. DFVLR-Mitt-81-19 DFVLR, West Germany, 1981 Conf. held in Cologne, 14 May 1981 Original language document was announced as X83-76555
(ESA-TT-744; DFVLR-Mitt-81-19) Avail: NTIS HC A05/MF A01; original German version available from DFVLR, Cologne DM 16.20

The outlook for civil aviation in Europe up to the year 2000 was discussed. Transport policy, airport planning, and factors influencing services supplied by airlines were considered. For individual titles, see N84-19308 through N84-19311.

N84-19308# European Space Agency, Paris (France).
DEVELOPMENT POSSIBILITIES IN COMMERCIAL AIR TRANSPORT IN THE FEDERAL REPUBLIC OF GERMANY
H.-G. Nuesser *In its* Develop. Possibilities and Restrictions in Air

Transport Oct. 1983 p 9-46 Transl. into ENGLISH of conf. paper presented at Entwicklungsmoeglichkeiten u. Restriktionen im Luftverkehr Forum, rept. DFVLR-Mitt-81-19 West Germany, Aug. 1981 p 11-46 Conf. held in Cologne, 14 May 1981 (For primary document see N84-19307 10-03)
Avail: NTIS HC A05/MF A01

Civil airline operations at West German airports from 1965 to 1978 were analyzed, and the situation in the 1990's was predicted. A growth in passenger rate of 4.9% per annum is expected, i.e., 75 million passengers, double the 1976 figure. Growth of demand is met by increasing aircraft loading and by using larger aircraft, rather than by increasing operating frequency. Implications for airport planning are discussed. Author (ESA)

N84-19309# European Space Agency, Paris (France).
POSSIBILITIES FOR THE FUTURE ORGANIZATION OF AIR TRANSPORT IN THE EUROPEAN COMMUNITY
J. Erdmenger *In its* Develop. Possibilities and Restrictions in Air Transport Oct. 1983 p 47-63 Transl. into ENGLISH of conf. paper presented at the Entwicklungsmoeglichkeiten u. Restriktionen im Luftverkehr Forum, rept. DFVLR-Mitt-81-19 West Germany, Aug. 1981 p 47-60 Conf. held in Cologne, 14 May 1981 (For primary document see N84-19307 10-03)
Avail: NTIS HC A05/MF A01

Air traffic between member states of the European Community up to the year 2000 is discussed. Pricing policy is criticized, and the shortcomings of the Chicago Convention on airline operations are underlined, particularly the concentration of passengers and big airports, and the unnatural division between routine and charter services. An open sky policy, similar to that of the United States is rejected, but more flexibility is advocated. Work of the European Commission on air tarrifs is reported on. Author (ESA)

N84-19310# European Space Agency, Paris (France).
TRANSPORT INFRASTRUCTURE: IS PLANNING STILL ACHIEVABLE
U. Christiansen *In its* Develop. Possibilities and Restrictions in Air Transport Oct. 1983 p 64-69 Transl. into ENGLISH of conf. paper presented at the Entwicklungsmoeglichkeiten u. Restriktionen im Luftverkehr Forum, rept. DFVLR-Mitt-81-19 West Germany, 1981 p 61-66 Conf. held in Cologne, 14 May 1981 (For primary document see N84-19307 10-03)
Avail: NTIS HC A05/MF A01

Airport planning procedures in West Germany are discussed. Simplification of the procedures is advocated. Author (ESA)

N84-19311# European Space Agency, Paris (France).
THE SUPPLIER: CONSTRAINTS AND PROSPECTS
H. St.Seidenfus *In its* Develop. Possibilities and Restrictions in Air Transport Oct. 1983 p 70-87 Transl. into ENGLISH of conf. paper presented at the Entwicklungsmoeglichkeiten u. Restriktionen im Luftverkehr Forum, rept. DFVLR-Mitt-81-19 West Germany, 1981 p 67-81 Conf. held in Cologne, 14 May 1981 (For primary document see N84-19307 10-03)
Avail: NTIS HC A05/MF A01

Constraints imposed on civil airline operations by fuel prices, public reaction to environment effects, air traffic control procedures, airport infrastructures, and air traffic authorities are discussed. The economic advantages for airlines and nations of better air transport planning are pointed out. Author (ESA)

N84-19312# Air Force Packaging Evaluation Agency, Wright-Patterson AFB, Ohio.
REDESIGN OF CARGO MOBILITY CONTAINERS Final Report
20 Oct. 1983 23 p
(AD-A137396) Avail: NTIS HC A02/MF A01 CSCL 13/4

Management and acquisition for a family of newly configured mobility containers was assigned to the Air Force Packaging Evaluation Agency (AFPEA). Program support, along with development funding for prototyping and testing, was provided by ASD/AFALD Productivity, Reliability, Availability and Maintainability (PRAM) office. The program objective, established by HQ USAF, was to implement an aggressive US Air Force Mobility Container Enhancement Program. As a result, new mobility containers were designed to maximize the cube usage of 463L pallets on C-141, C-130, KC-135, CRAF, and C-5 aircraft for MAC, TAC, SAC, NGB, and AFRES cargo mobility operations for their War Readiness Spares Kits (WRSK), Base Level Spares Support (BLSS), and Combat Follow-on Supply Support (CFOSS). Author (GRA)

N84-19313# Civil Aeronautics Board, Washington, D.C.
AIRPORT ACTIVITY STATISTICS OF CERTIFICATED ROUTE AIR CARRIERS Annual Report
31 Dec. 1982 368 p Prepared in cooperation with FAA, Washington, D.C.
(AD-A137418) Avail: NTIS HC A16/MF A01 CSCL 01/2

This report furnishes airport activity of the Certificated Route Air Carriers. Included in the data are passenger enplanements, tons of enplaned freight, express, and mail. Both scheduled and non-scheduled service, and domestic and international operations are included. These data are shown by airport and carrier. Table 7 also included are departures by airport, carrier and type of operation, and type of aircraft. Author (GRA)

N84-19314# Boeing Military Airplane Development, Seattle, Wash.
ELECTROSTATIC SAFETY WITH EXPLOSION SUPPRESSANT FOAMS Final Report, Mar. 1980 - Sep. 1982
A. F. Grenich and F. F. Tolle Wright-Patterson AFB, Ohio AFWAL Mar. 1983 171 p
(Contract F33615-79-C-2093; AF Proj. 3048)
(AD-A137503; AFWAL-TR-83-2015) Avail: NTIS HC A08/MF A01 CSCL 21/2

Studies were made of the accumulation of electrostatic charges and subsequent discharges in aircraft fuel systems using explosion suppressant foams. The studies included a fuel system survey, small scale experiments, and fuel inlet nozzle designs. The results were used to develop guidelines for minimizing electrostatic hazards in aircraft fuel systems. Author (GRA)

N84-19315# Technische Hogeschool, Delft (Netherlands). Luchtvaart- en Ruimtevaarttechnik.
CENTRALIZED WARNING SYSTEMS FOR THE NEW GENERATION OF AIRLINERS [CENTRALLE WAARSCHUWINGSSYSTEMEN VOOR DE NIEUWE GENERATIE VERKEERSVLIEGTUIGEN]
M. L. Wijnheijmer Feb. 1983 52 p refs In NEPALI Submitted for publication
(VTH-LR-373) Avail: NTIS HC A04/MF A01

Design and operation of warning systems to be installed in aircraft are described. The ARINC 726 specification, and warning systems based on it are discussed. It is shown that within the same specification there is a broad domain for very different applications, with respect to components and operational aspects. The Boeing Engine Indicating and Crew Alerting System, the McDonnell Douglas engine monitoring and display system, Airbus Industry systems, and Fokker systems are presented.
Author (ESA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-19316 Heimatverband fuer den Kreis Steinburg, Itzenhoe (West Germany). Forschungsberichte.
AIRCRAFT OVER STEINBERG (WEST GERMANY) [LUFTFAHRZEUGE UEBER STEINBURG]
Gero Hoppe 1982 15 p refs In GERMAN
(Rept-5/1982) Copyright. Avail: Issuing Activity

A short historical review of the aviation over the Steinburg district from the airport Hungriger Wolf (Hohenlockstedt) is presented. It covers the period 1905-1980. Author (ESA)

N84-19317*# Theory and Applications Unlimited Corp., Los Gatos, Calif.

SIMULATION AND ANALYSIS OF DIFFERENTIAL GLOBAL POSITIONING SYSTEM FOR CIVIL HELICOPTER OPERATIONS

Robert P. Denaro and Algyte R. Cabak Dec. 1983 141 p refs (Contract NAS2-11339)

(NASA-CR-166534; NAS 1.26:166534) Avail: NTIS HC A07/MF A01 CSCL 17G

A Differential Global Positioning System (DGPS) computer simulation was developed, to provide a versatile tool for assessing DGPS referenced civil helicopter navigation. The civil helicopter community will probably be an early user of the GPS capability because of the unique mission requirements which include offshore exploration and low altitude transport into remote areas not currently served by ground based Navaids. The Monte Carlo simulation provided a sufficiently high fidelity dynamic motion and propagation environment to enable accurate comparisons of alternative differential GPS implementations and navigation filter tradeoffs. The analyst has provided the capability to adjust most aspects of the system, the helicopter flight profile, the receiver Kalman filter, and the signal propagation environment to assess differential GPS performance and parameter sensitivities. Preliminary analysis was conducted to evaluate alternative implementations of the differential navigation algorithm in both the position and measurement domain. Results are presented to show that significant performance gains are achieved when compared with conventional GPS but that differences due to DGPS implementation techniques were small. System performance was relatively insensitive to the update rates of the error correction information. Author

N84-19318# Naval Research Lab., Washington, D. C. Aerospace Systems Div.

FREQUENCY STABILITY ANALYSIS OF GPS (GLOBAL POSITIONING SYSTEM) NAVSTARS 3 AND 4 RUBIDIUM CLOCKS AND THE NAVSTARS 5 AND 6 CESIUM CLOCKS Final Report

Thomas B. McCaskill, James A. Buisson, and Sarah B. Stebbins 20 Dec. 1983 101 p

(NR Proj. X06-99)

(AD-A137376; NRL-8778) Avail: NTIS HC A06/MF A01 CSCL 17/7

This report describes the on-orbit frequency stability performance analysis of the Global Positioning System (GPS) NAVSTARs 3 and 4 rubidium clocks and the NAVSTARs 5 and 6 cesium clocks. Time domain measurements, taken from the four GPS monitor sites, have been analyzed to estimate the short and long-term frequency stability performance of the NAVSTAR clocks. The data presented include measurements from 1981, 1982, and the first 100 days of 1983. Author (GRA)

N84-19319# Federal Aviation Administration, Washington, D.C. Systems Engineering Service.

AUTOMATED EN ROUTE AIR TRAFFIC CONTROL ALGORITHMIC SPECIFICATIONS. VOLUME 3: FLIGHT PLAN CONFLICT PROBE

W. P. Niedringhaus, I. Frolow, J. C. Corbin, A. H. Gisch, and N. J. Taber Sep. 1983 194 p

(AD-A136795; FAA-ES-83-6) Avail: NTIS HC A09/MF A01 CSCL 17/7

This specification establishes design criteria for the Flight Plan Conflict Probe (FPCP), a part of the initial automation for the Advanced Automation System of the FAA's next generation air traffic control system. The algorithm provides data for a display to air traffic controllers whenever any two aircraft are predicted to approach each other within certain separation criteria in the horizontal and vertical dimensions. Such a pair of aircraft is called a conflict. Trajectory Estimation, another function of the Advanced Automation System, models the predicted position of each aircraft as a trajectory, consisting of points in (x,y,z,t) space and the line segments connecting them. Trajectories reflect both pilot intent (his approved flight plan) and current position (radar reports). FPCP automatically tests all trajectory pairs for conflicts. FPCP is designed to be compatible with current air traffic control procedures. It displays information early enough for controllers to resolve conflicts in a deliberate fashion. It alerts the the controller when prompt action is deemed necessary to resolve a conflict. GRA

N84-19320# Federal Aviation Administration, Washington, D.C. Systems Engineering Service.

AUTOMATED EN ROUTE AIR TRAFFIC CONTROL ALGORITHMIC SPECIFICATIONS. VOLUME 4: SECTOR WORKLOAD PROBE

W. P. Niedringhaus and A. H. Gisch Sep. 1983 122 p

(AD-A136796; FAA-ES-83-7; FAA-AES-320) Avail: NTIS HC A06/MF A01 CSCL 17/7

This specification establishes design criteria for a Sector Workload Probe algorithm, which is part of the initial automation for the Advanced Automation System of the Federal Aviation Administration's Air Traffic Control System. This algorithm calculates measures related to workload. The algorithm takes into account a variety of measures. These measures include the following: average aircraft count; number of expected aircraft or airspace conflicts (as generated by two other advanced automation algorithms, Flight Plan Conflict Probe and Airspace Probe); a measure of actions which must be carried out by controllers; a density measure; and an overall measure. For every sector, each measure is projected for various time intervals of approximately 15 minutes up to about two hours in the future. An Area Supervisor or Area Manager may, at any time, request a display of the current and projected workload measures for a specified sector or set of sectors. Also, the Area Supervisor may monitor selected sector(s) to determine if certain measures exceed or fall below thresholds that he or she specifies. GRA

N84-19321# Naval Postgraduate School, Monterey, Calif.

AN APPLICATION OF THE NAVSTAR GLOBAL POSITIONING SYSTEM IN NAVIGATION TRACK RECONSTRUCTION FOR NAVAL EXERCISES M.S. Thesis

Don Waymon Driskill Sep. 1983 89 p

(AD-A136807; AD-E301284) Avail: NTIS HC A05/MF A01 CSCL 17/7

This study investigates an application of the Navstar Global Positioning System (GPS) in Naval exercise reconstruction. It examines the feasibility of combining Navstar GPS, via Naval Tactical Support Activity (NTSA) data collection methods, with the Mini-Reconstruction System (MRS), a portion of the Tactical Information Management System (TIMS). The study describes Naval exercise reconstruction in general. It describes the Mini-Reconstruction Systems and exercise reconstruction using this system. Navstar GPS is described in detail. The methodology and the theoretical background for this application is discussed. Finally, the impact of GPS input on exercise reconstruction is examined in a comparison of operational characteristics of competitive navigation systems. Author (GRA)

N84-19322# Federal Aviation Administration, Washington, D.C. Systems Engineering Service.

OPERATIONAL AND FUNCTIONAL DESCRIPTION OF AERA 1.01

W. J. Swedish, B. C. Simmerman, A. W. Lipps, and J. G. Steinbacher 31 Sep. 1983 99 p

(AD-A136831; FAA-ES-83-9) Avail: NTIS HC A05/MF A01 CSCL 17/7

The AERA 1.01 functions, to be implemented as part of the Advanced Automation System for en route air traffic control, consist of: Trajectory Estimation; Flight Plan Conflict Probe; Airspace Probe; and Sector Workload Probe. This document presents a high-level operational and functional description of these four advanced automation functions. The operational description discusses the effects of the advanced automation functions on the controller:

what information must be provided to the functions, what information is received from the function, which controller receives that information, and what the controller's response should be. The effect of these functions on the structure of the controller's job, such as training and staffing requirements, is also discussed. The functional description presents the logical organization of the advanced automation functions, including the role of each function and the interfaces between functions. Author (GRA)

N84-19323# Naval Postgraduate School, Monterey, Calif.
A COMPARISON OF TWO EXTENDED KALMAN FILTER ALGORITHMS FOR AIR-TO-AIR PASSIVE RANGING M.S. Thesis
Ward Hubert Ewing Sep. 1983 69 p
(AD-A136838) Avail: NTIS HC A04/MF A01 CSCL 17/7

Two Extended Kalman Filter algorithms for air-to-air passive ranging are proposed, and examined by computer simulation. One algorithm uses only bearing observations while the other uses both bearing and elevation angles. Both are tested using a flat-Earth model and also using a spherical-Earth model where the benefit of a simple correction for the curvature-of-the-Earth effect on elevation angle is examined. The effects of varied angle measurement precision and of varied range estimate accuracy are investigated. Both filters are found to perform acceptably under most conditions, with the bearing-elevation algorithm generally providing superior results. GRA

N84-19324# Federal Aviation Administration, Washington, D.C. Systems Engineering Service.
AUTOMATED EN ROUTE AIR TRAFFIC CONTROL ALGORITHMIC SPECIFICATIONS. VOLUME 2: AIRSPACE PROBE
J. A. Kingsbury, N. S. Malthouse, and K. B. Schwamb 31 Sep. 1983 138 p
(AD-A136850; DOT/FAA/ES-83/5) Avail: NTIS HC A07/MF A01 CSCL 09/2

This algorithmic specification establishes the design criteria for four advanced automation software functions to be included in the initial software package of the Advanced Automation System (AAS). The need for each function is discussed within the context of the existing National Airspace System (NAS). A top-down definition of each function is provided with descriptions on increasingly more detailed levels. The final, most detailed description of each function identifies the data flows and transformations taking place within each function. This document consists of five volumes. Volume 2, airspace probe, contains a functional design for the use of trajectory data to predict penetrations of airspace, volumes from which the general flying public is normally restricted. 12 GRA

N84-19325# Federal Aviation Administration, Washington, D.C. Systems Engineering Service.
AUTOMATED EN ROUTE AIR TRAFFIC CONTROL ALGORITHMIC SPECIFICATIONS. VOLUME 5: DATA SPECIFICATION
L. Fellmand and C. W. Schuck Sep. 1983 92 p
(AD-A136851; DOT/FAA/ES-83/8) Avail: NTIS HC A05/MF A01 CSCL 09/2

This algorithmic specification establishes the design criteria for four advanced automation software functions to be included in the initial software package of the advanced automation system (AAS). The need for each function is discussed within the context of the existing national airspace system (NAS). A top-down definition of each function is provided with descriptions on increasingly more detailed levels. The final, most detailed description of each function identifies the data flows and transformations taking place within each function. This document consists of five volumes. Volume 5, Data Specification, contains the definitions of important data constructs used across all the algorithmic specifications. The data are accumulated in a modified relational data base. GRA

N84-19326# Federal Aviation Administration, Washington, D.C. Systems Engineering Service.
OPERATIONAL AND FUNCTIONAL DESCRIPTION OF THE AERA PACKAGES
A. W. Lipps, W. J. Swedish, and B. C. Zimmerman 11 Sep. 1983 120 p
(AD-A136852; DOT/FAA/ES-83/10) Avail: NTIS HC A06/MF A01 CSCL 09/2

The AERA consists of a series of new or enhanced software functions which help the performance of en route air traffic control. Current planning calls for the AERA functions to be developed incrementally in a series of six separate packages. This document presents an overview of the AERA packages, with particular emphasis on the way the AERA functions interact with other ATC functions and with the controller. Functional descriptions of each package present the logical organization of the AERA functions, including the role of each function and the interfaces between functions. The operational descriptions discuss how the AERA functions will be used by the controller: when the function is invoked, what information is exchanged between the function and the controller, and how the controller is expected to respond. GRA

N84-19327# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
POSITION DETERMINATION WITH LORAN-C TRIPLETS USING THE HEWLETT-PACKARD HP-67C, THE SHARP PC-1500 (TRS-80 PC-2) OR THE RADIO SHACK TRS-80 MODEL 100 PORTABLE COMPUTERS
Rex H. Shudde Sep. 1983 51 p
(AD-A137009; NPS55-83-023) Avail: NTIS HC A04/MF A01 CSCL 17/7

This report contains user instructions and program listings for a Loran-C position determination algorithm for use on an Hewlett-Packard HP-75C, a Sharp PC-1500 (Radio Shack TRS-80 PC-2) and a Radio Shack Model 100 portable computers. Author (GRA)

N84-19328# Federal Aviation Administration, Washington, D.C. Systems Engineering Service.
AUTOMATED EN ROUTE AIR TRAFFIC CONTROL ALGORITHMIC SPECIFICATIONS. VOLUME 1: TRAJECTORY ESTIMATION
J. A. Kingsburg, D. A. Pool, S. K. Ghosh, N. S. Malthouse, and G. J. Rouillier Sep. 1983 395 p
(AD-A137088; DOT/FAA/ES-83/4) Avail: NTIS HC A17/MF A01 CSCL 01/5

This Algorithmic Specification establishes the design criteria for four advanced automation software functions to be included in the initial software package of the Advanced Automation System (AAS). The need for each function is discussed within the context of the existing National Airspace System (NAS). A top-down definition of each function is provided with descriptions on increasingly more detailed levels. The final, most detailed description of each function identifies the data flows and transformations taking place within each function. This document consists of five volumes. Volume 1, Trajectory Estimation, contains a functional design for deriving a predicted four dimensional (space and time) path, or trajectory, for each participating aircraft. GRA

N84-19329# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Navigation und Flugbahnvermessung.
EVALUATION OF RADIO NAVIGATION SYSTEMS AND THEIR CONFIGURATION WITH RESPECT TO MINIMUM COST
Wilfried Gerling Jul. 1983 41 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-847)
(DFVLR-FB-83-32; ESA-TT-847) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 15,50

Different Rho/Theta and Rho/Rho navigation systems were compared to find minimum cost configurations of ground equipment, using methods that yield the minimum number of ground stations and their most favorable locations. The VHF Omnirange navigation/Distance measuring equipment (VOR/DME) systems are found to be applicable, but increased navigational efficiency standards are limited by the degree of accuracy of DME. The DME-supported azimuth systems (DAS) fulfil the same requirements

at a substantially lower cost; DAS heavy-duty systems have only small advantages compared to basic DAS systems. The DME/DME systems represent an interesting alternative to DAS at similar cost, but limited accuracy limits the approachable navigational efficiency as for VOR/DME. Author (ESA)

N84-19330# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
THE SCHULER PRINCIPLE: A DISCUSSION OF SOME FACTS AND MISCONCEPTIONS
C. Huber and W. J. Bogers May 1983 124 p refs
(EUT-83-E-136; ISBN-90-6144-136-6; ISSN-0167-9708) Avail: NTIS HC A06/MF A01

The so called Schuler period and the role gravity plays in Schuler tuned inertial navigation systems are discussed. It is stated that Schuler tuning does not necessarily imply the Schuler oscillation period of 84.4 min (at the Earth's surface). Not all devices exhibiting the Schuler oscillation period of 84.4 min can be used as a vertical reference on a moving base. The existence of a gravity field is essential for the existence of an oscillation period, but it is not an absolute requirement for the basic function of a Schuler tuned vertical reference, with very few exceptions (e.g., Schuler's gyro pendulum). Demonstration models of a Schuler tuned system are described, and mechanical topics related to the Schuler principle and d'Alembert's double pendulum are considered. Author (ESA)

N84-19331# Coast Guard, Washington, D.C.
OMEGA GLOBAL RADIONAVIGATION: A GUIDE FOR USERS
Nov. 1983 64 p
(PB84-134345) Avail: NTIS HC A04/MF A01 CSCL 17G

Signal format; Signal synchronization; Basic characteristics of the omega radio wave; Transmitter signal comparison; Lane identification; Lane ambiguity resolution; Omega propagation; Unpredictable changes to propagation conditions; The omega monitor receiver; Omega notices and navigational warnings and Omega charts and publications. GRA

N84-19332# Transportation Systems Center, Cambridge, Mass.
NAVSTAR GPS SIMULATION AND ANALYSIS PROGRAM Final Report, Oct. 1981 - Jul. 1983
R. M. Kalafus, J. Kraemer, N. Knable, and J. Vilcans Oct. 1983 242 p refs
(PB84-134402; DOT-TSC-RSPA-83-11) Avail: NTIS HC A11/MF A01 CSCL 17G

The NAVSTAR global positioning system can provide accurate two and three dimensional service to a wide spectrum of users to meet civil navigation requirements. The quality of the service depends on the availability of the satellite signals, the satellite geometries, the timing accuracy of the signals, and the user receiver design. Specific issues which need resolution are identified. These include: (1) the operational requirements for air, marine, and land; (2) analysis simulation tools to characterize users and equipment; (3) receiver-processor design alternatives; (4) satellite outages; (5) satellite failures; (6) selective availability; (7) differential operation of the GPS; (8) receiver costs; and (9) errors. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-19333*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN ASSESSMENT OF THE CAPABILITY TO CALCULATE TILTING PROP-ROTOR AIRCRAFT PERFORMANCE, LOADS AND STABILITY
Wayne Johnson Mar. 1984 25 p refs
(NASA-TP-2291; A-9411; NAS 1.60:2291) Avail: NTIS HC A02/MF A01 CSCL 01C

Calculated performance, loads, and stability of the XV-15 tilt rotor research aircraft are compared with wind tunnel and flight measurements, to define the level of the current analytical capability for tilting prop rotor aircraft, and to define the requirements for additional experimental data and further analysis development. The correlation between calculated and measured behavior is generally good, although there are some significant discrepancies. Based on this correlation, the analysis is assessed overall as being adequate for the design, evaluation, and testing of tilting prop rotor aircraft. A general assessment of the state of the art of tilt rotor predictive capability is given. Specific areas are identified where improvements in the capability to calculate performance, loads, and stability are desirable. Requirements for more accurate and detailed data which support the development of improved analytical models are identified as well. Author

N84-19334*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IN-FLIGHT ACOUSTIC TESTING TECHNIQUES USING THE YO-3A ACOUSTIC RESEARCH AIRCRAFT
J. L. Cross and M. E. Watts Feb. 1984 11 p refs Document previously announced as A84-12342
(NASA-TM-85895; A-9660; NAS 1.15:85895) Avail: NTIS HC A02/MF A01

This report discusses the flight testing techniques and equipment employed during air-to-air acoustic testing of helicopters at Ames Research Center. The in flight measurement technique used enables acoustic data to be obtained without the limitations of anechoic chambers or the multitude of variables encountered in ground based flyover testing. The air-to-air testing is made possible by the NASA YO-3A Acoustic Research Aircraft. This 'Quiet Aircraft' is an acoustically instrumented version of a quiet observation aircraft manufactured for the military. To date, tests with the following aircraft have been conducted: YO-3A background noise; Hughes 500D; Hughes AH-64; Bell AH-1S; Bell AH-1G. Several system upgrades are being designed and implemented to improve the quality of data. This report will discuss not only the equipment involved and aircraft tested, but also the techniques used in these tests. In particular, formation flying position locations, and the test matrices will be discussed. Examples of data taken will also be presented. Author

N84-19335*# National Aeronautics and Space Administration, Washington, D. C.
NATIONAL AEROSPACE LABORATORY NEWS (JAPAN)
Jun Takeda Aug. 1982 18 p Transl. into ENGLISH of Kogiken Nyusu (Japan), no. 275, Mar. 1982 8 p Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by National Aerospace Lab., Tokyo
(Contract NASw-3542)
(NASA-TM-76962; NAS 1.15:76962) Avail: NTIS HC A02/MF A01 CSCL 01C

Tests carried out in November 1981 on the stationary flap of STOL test planes at Kakuda Labs are described. Acoustic pressure, outer plate temperature of the fore flap, and acceleration, strain, and temperature of the outer plate of the main flap were measured. High load turbine inlet distortion experiments were also performed. Results of these experiments are discussed. Author

N84-19336# Naval Intelligence Support Center, Washington, D. C. Translation Div.
APPLICATIONS OF COMPOSITE MATERIALS IN HELICOPTER CONSTRUCTION
Gilbert Beziac 21 Nov. 1983 41 p Transl. into ENGLISH from Aeronaut. Astronaut. (France), no. 98, 1983 p 21-40
(AD-A136678; NISC-TRANS-7224) Avail: NTIS HC A03/MF A01 CSCL 01/3

The helicopter is a much more complex machine and more difficult to construct than a similar size aircraft owing to several factors: (1) mechanical transmission elements which must provide a very great reduction of the main engine speed; (2) presence of an antitorque rotor placed in the rear of the craft at the end of a

long and relatively flexible tail boom; (3) presence of dynamic vibrations from the rotors of a level which is higher as the speed is greater, requiring the dimensioning of a number of transmission, control, and structural elements for fatigue as well as an optimization of the dynamics of the rotating assemblies and of the vibrational responses in the cockpit and the cabin in the presence of vibration absorbers either at the rotor or between the rotor and the fuselage or in the cabin itself; and (4) the need for a given total weight to seek the minimal empty weight so that the machine can perform vertical flight with the best economy of operation possible. The efforts conducted for many decades by designers of helicopters and turboshaft engines and has made a steady improvement in the operational capabilities in both the military and the civilian domain and a reduction in production and operating costs. Author

N84-19337# Boeing Aerospace Co., Seattle, Wash.
ADVANCED AIRCRAFT ELECTRICAL SYSTEM CONTROL TECHNOLOGY DEMONSTRATOR. PHASE 1: REQUIREMENTS ANALYSIS & PRELIMINARY DESIGN. PHASE 2: DETAILED DESIGN Final Report, Sep. 1980 - Mar. 1983
T. R. Boldt, G. L. Dunn, D. E. Hankins, P. J. Leong, and I. S. Mehdi May 1983 157 p
(Contract F33615-80-C-2004)
(AD-A136758; D180-25927-4; AFWAL-TR-83-2033) Avail: NTIS HC A08/MF A01 CSCL 12/2

The Air Force Wright Aeronautical Laboratories (AFWAL) Aero Propulsion Laboratory has been sponsoring research and development programs directed toward applying advanced solid state power switching and computer control technology to aircraft electrical power systems. Development of components and subsystems utilizing solid state power switching and microprocessor-based computer technology has progressed rapidly. Multiplexing techniques have been developed for transmission and processing of electrical system control data. This data usually consists of a large number of discrete (on/off) signals and information for solving control logic equations. Multiplex hardware and software designs have been optimized for electrical system control applications such as the B-1 E-Mux system. This, however, results in high initial development, integration and logistics costs. On large aircraft the amount of signal processing and data transfer may justify the use of a separate and optimized multiplex system for electrical system control; however, in the case of smaller aircraft this may not be the most cost effective solution. GRA

N84-19338# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SUBOPTIMAL MISSILE EVASION THROUGH A SENSITIVITY ANALYSIS OF PROPORTIONAL GUIDANCE TO TARGET EVASION MANEUVERS M.S. Thesis
Stephen J. McNamara Dec. 1983 123 p
(AD-A136803; AD-E301284; AFIT/GA/AA/83D-6) Avail: NTIS HC A06/MF A01 CSCL 01/2

The evasion problem was studied using a nonlinear simulation to simulate target and missile dynamics. The simulation applied drag, lag, acceleration bounding and other limits to the missile and target. The effect of using three variations of proportional guidance were studied: classic (cross product steering); radar (velocity of closure is used) and heat (the missile has angle and angle rate information only). The target used constant turn maneuver and a switching maneuver, both of which were evaluated for sensitivity to timing, aspect angle, missile velocity, seeker biasing and proportional guidance type. The missile was lethal against any constant turn sustained by the target for more than one to two seconds. Constant turn evasion maneuvers caused the largest misses and the least sensitivity to timing errors from head-on and front quarter intercepts. The switching maneuver was much better at evading the missile than the constant break turn. The largest misses for the switching maneuver occurred from a head-on aspect. Maneuver execution orthogonal to the missile guidance plane was paramount and in independent of the maneuver attempted. The proportional guidance type had little effect on the maximum miss achieved, especially for the switching maneuver; however, guidance type strongly affected the timing of the best maneuver. The missile was an order of magnitude more sensitive to biasing of its angle measurements than to biasing of its angle rate, range or range rate measurements. The effect of biasing needed to be coordinated with the target maneuver, otherwise the net effect each had on the missile seeker could cancel. GRA

N84-19339# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN OPEN LOOP MISSILE EVASION ALGORITHM FOR FIGHTERS M.S. Thesis
Gregory E. Straight Nov. 1983 128 p
(AD-A136834; AFIT/GAE/AA/83D-7) Avail: NTIS HC A07/MF A01 CSCL 12/1

Proportional navigation (PN) is a guidance law used on many missiles today. Closed loop missile evasion maneuvers for fighters flying against proportional navigation missiles have been investigated, but they all require that the fighter have relative state information that is currently unavailable. An open loop missile evasion algorithm is needed today to allow pilots to best maneuver their aircraft against PN guided missiles to improve the chances of survival. A preliminary investigation of fighter maneuvers revealed the strengths and weakness of particular maneuvers. Maximum g turns and barrel rolls were expected to show little increase in miss distance over a non-maneuvering target. A switching/jinking maneuver proved a good maneuver. A switching/jinking maneuver coupled with a last second bank reversal was thought to be the best evasive maneuver. The computer simulation TACTICS IV was used to simulate fighter/missile engagements. From those simulations the miss distance was calculated and used to determine the best fighter maneuver. As expected maximum g turns in any direction and barrel rolls proved to be the worst maneuvers. GRA

N84-19340# Dayton Univ., Ohio. Research Inst.
EVALUATION OF THE CRACK GROWTH GAGE CONCEPT AS AN INDIVIDUAL AIRCRAFT TRACKING DEVICE, VOLUME 1 Final Technical Report, 14 Nov. 1980 - 9 May 1983
F. J. Giessler and J. P. Gallagher Wright-Patterson AFB, Ohio AFWAL Sep. 1983 165 p
(Contract F33615-80-C-3234; AF Proj. 2401)
(AD-A136932; AFWAL-TR-83-3082-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 01/3

An analytical and experimental program was conducted to evaluate the crack growth gage concept for application as an individual aircraft tracking device. Three gage designs were evaluated. Volume 1 discusses the evaluation of two versions of a stepped thickness gage and a stepped width gage. Volume 2 discusses the evaluation of a side-grooved constant thickness gage. An analytical evaluation of the change in transfer function corresponding to gage design parameter changes was performed to determine the configuration of the gages to be tested. Initial spectrum tests were conducted on the first stepped gage design to determine the ranking ability of the gage. Then constant amplitude tests were conducted on the second stepped gage design. A modification of the gage was made to improve spectrum test response. The modified gage was subjected to both constant amplitude testing and spectrum testing. The analytically derived crack growth rates were compared to the test data. In general, the analysis predicted slightly higher growth rates than observed. GRA

N84-19341# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
EVALUATION OF THE CRACK GROWTH GAGE CONCEPT AS AN INDIVIDUAL AIRCRAFT TRACKING DEVICE, VOLUME 2 Final Technical Report, 14 Nov. 1980 - 9 May 1983
A. F. Grandt, Jr. and A. Dumanis-Modan Wright-Patterson AFB, Ohio AFWAL Sep. 1983 137 p
(Contract F33615-80-C-3234; AF Proj. 2401)
(AD-A136933; AFWAL-TR-83-3082-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 01/3

This report summarizes research conducted to develop the crack growth gage technique for individual aircraft tracking. The crack growth gage concept consists of mounting precracked

coupons on a structural component so that service loads cause measurable crack extension in the coupon (or gage). Fracture mechanics techniques are then used to relate the gage crack growth with extension of an assumed structural flaw. Thus, the precracked coupon serves as a sensor which records service loads and responds with an output which may be related to the service life of the parent structural member. The effort described here involved two primary goals: development of a thin crack gage coupon which simulates thick section flaw growth, and development of an improved analysis method for relating gage and assumed structural crack growth. The approach employed for the first task was to design a crack gage which contained side-grooves along the crack plane. The side-grooves forced plane strain conditions in the thin coupon, and provided fatigue crack retardation behavior which more nearly matched that seen in the thicker structural member. A series of experiments conducted with the side-grooved gage geometry compared favorably with numerical predictions for the gage response. GRA

N84-19342# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

MINIMUM TIME TURNS WITH DIRECT SIDEFORCE M.S. Thesis

M. R. Brinson Dec. 1983 85 p

(AD-A136958; AFIT/GAE/AA/83D-1) Avail: NTIS HC A05/MF A01 CSCL 20/4

The objective of the study is to find the optimal trajectories and corresponding minimum turning times for a high performance aircraft with and without direct sideforce to perform a prescribed turn. These trajectories and times are then compared to evaluate the benefit of direct sideforce. Optimal control theory is applied to solve the minimum time to turn optimal control problem using a suboptimal control problem approach and a second order parameter optimization method. The results indicate that the use of direct sideforce is beneficial in reducing turning time. In addition, the use of sideforce causes a small loss of energy for initial velocities lower and much higher than the corner velocity. Author (GRA)

N84-19343# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).

CIVIL COMPONENT PROGRAM INTEGRATED WING-ENGINE-SYSTEM (IFAS), PHASE 1 Final Report, Mar. 1982

Bernd Ewald Bonn Bundesministerium fuer Forschung und Technologie Aug. 1983 88 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-83-018; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18,50

Computational methods in subsonic and transonic regimes for flows with strong interference were developed. Transonic wing development was conducted using experimental and theoretical results. Canard wing configurations were investigated. For wings with strong interferance, the experimental investigations were focused on low speed engine simulation. A slat/flap-system for the transonic wing was developed and tested using a panel half-model. Author (ESA)

N84-19344# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany). Abt. Bauwesen.

LONG TERM IN-SERVICE EVALUATION OF CFRP COMPONENTS (SPOILERS) ON AIRBUS A300, PHASE 1 Final Report, Dec. 1982

Gerold Porsche Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 61 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-83-028; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

The in-service evaluation of 22 carbon fiber reinforced plastic (CFRP) spoilers is presented. Strength tests were performed on wet CFRP spoilers at 55 and 70 C. Based on experimental and theoretical verification, the component was fully certified. Stiffness measurements prior to installation show very small scattering. Author (ESA)

N84-19345# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

LECTURE NOTES ON THE PRINCIPLES AND PRACTICE OF AIRPLANE PERFORMANCE PREDICTION. PART 1: BASIC ELEMENTS

G. J. J. Ruijgrok Aug. 1983 136 p Presented at Tech. Univ. of Bandung (ITB) Summer Course, Bandung, Indonesia, Aug. 1983 Sponsored by the Indonesian and Netherlands Governments 3 Vol.

(VTH-LR-385-Vol-1) Avail: NTIS HC A07/MF A01

Subsonic airplane performance prediction is introduced. Cartesian axis systems and angles; airplane condition, flight condition, and type of flight; atmosphere effects; measurement of altitude and airspeed; airplane aerodynamics; the piston engine and propeller; gas turbine engine characteristics and flight load factors are discussed. Author (ESA)

N84-19346# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

LECTURE NOTES ON THE PRINCIPLES AND PRACTICE OF AIRPLANE PERFORMANCE PREDICTION. PART 2: POINT-PERFORMANCE IN STEADY SYMMETRIC AND UNSYMMETRIC FLIGHT

G. J. J. Ruijgrok Aug. 1983 137 p Presented at Tech. Univ. of Bandung (ITB) Summer Course, Bandung, Indonesia, Aug. 1983 Sponsored by the Indonesian and Netherlands Governments 3 Vol.

(VTH-LR-385-Vol-2) Avail: NTIS HC A07/MF A01

Performance prediction of subsonic airplanes in steady symmetric flight, and in steady symmetric glide is introduced. Power required and power available; performance prediction using analytical expressions for thrust and drag; effect of altitude and of changes of power available and airplane configuration; effect of weight on performance; and turning performance are discussed. Author (ESA)

N84-19347# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

LECTURE NOTES ON THE PRINCIPLES AND PRACTICE OF AIRPLANE PERFORMANCE PREDICTION. PART 3: PATH PERFORMANCE IN QUASI STEADY AND UNSTEADY SYMMETRIC FLIGHT

G. J. J. Ruijgrok Aug. 1983 138 p refs Presented at Tech. Univ. of Bandung (ITB) Summer Course, Bandung, Indonesia, Aug. 1983 Sponsored by the Indonesian and Netherlands Governments 3 Vol.

(VTH-LR-385-Vol-3) Avail: NTIS HC A07/MF A01

Subsonic aircraft cruise performance prediction; criteria for the assessment of the economic value of airplane performance; climb and descent performance; takeoff performance; and landing performance are outlined. Author (ESA)

N84-19348# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

SKETCH: A COMPUTER PROGRAM FOR PLOTTING A TRANSPORT AIRPLANE CONFIGURATION IN CONCEPTUAL DESIGN

C. Bil Jun. 1983 41 p refs

(VTH-LR-388) Avail: NTIS HC A03/MF A01

The computer program SKETCH, for automatically plotting an elementary airplane configuration drawing (wing + fuselage + tail planes + nacelles) was developed for conceptual design studies of transport airplanes. Wing and tail plane geometries are derived from the major design parameters, e.g., wing area, aspect ratio, sweep angle, tail volume coefficients. Nondimensional parameters are used to define the location of the components and to allow rapid reorientation without losing the coherency of the configuration. Results of SKETCH applied to existing airplanes are presented. Directions for use of the program are included. Author (ESA)

N84-19867# Army Aviation Research and Development Command, St. Louis, Mo.
AVRADCOM RESEARCH HELICOPTER VIBRATION
Story C. Stevens *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 3-20 refs (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01/3

N84-19869# Joint Technical Coordinating Group for Aircraft Survivability, Washington, D.C.
AIRCRAFT SURVIVABILITY
Dale B. Atkinson *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 33-38 (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01B

N84-19886*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF ACTIVE LOADS CONTROL FOR AIRCRAFT LANDING GEAR
David L. Morris (AFWAL) and John R. McGehee *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 79-89 (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01/3

N84-19903# Harris Corp., Melbourne, Fla.
VIBRATION TEST ENVIRONMENTS FOR ELECTRONICS MOUNTED IN A REMOTELY PILOTED VEHICLE
Vernon R. Beatty *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 125-134 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01/3

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N84-19349# Analytic Sciences Corp., Reading, Mass.
LOGISTICS ENGINEERING DESIGN TECHNIQUES FOR FAULT-TOLERANT AVIONICS SYSTEMS Interim Report, Apr. 1982 - Jul. 1983
M. H. Veatch, A. B. Calvo, and J. C. McManus Brooks AFB, Tex. Air Force Human Resources Lab. Jan. 1984 60 p
(Contract F33615-82-C-0002; AF Proj. 1710)
(AD-A137456; AFHRL-TP-83-41) Avail: NTIS HC A04/MF A01 CSCL 15/5

The logistics analysis methods in this paper are appropriate for integrated, fault-tolerant systems, such as the Integrated Communication, Navigation, Identifications Avionics (ICNIA) program, early in the development cycle. In particular, fault tolerance is one feature that an ICNIA system must have if reliability and supportability cost benefits are to be realized. Historically, logistics engineering disciplines have been applied to new avionics designs in the later stages of development. However, the logistics engineering techniques in the early stages of design should not impose unrealistically detailed data requirements for analysis. This research in the areas of reliability, supportability, and survivability proceed by front-end analysis to determine the applicability of existing techniques. Both traditional and innovative maintenance concepts were investigated. In particular, the increased ability to sustain sorties with limited repair capability was evaluated for deferred repair policies. A detailed example is presented to demonstrate the reliability and supportability methodologies. The outputs of this research in each area consists of documented methods for evaluation of integrated, fault-tolerant designs and the associated logistics options, as well as specific evaluations and design feedback for the ICNIA designs. The Mission Reliability Model (MIREM) was developed to determine the reliability of avionics designs in the early stages of development while the Simulation of Operational Availability/Readiness (SOAR) model was extended to describe the supportability parameters of the designs. GRA

N84-19350# Optical Design Service, Tucson, Ariz.
AN OPTICAL ANALYSIS OF THE FARRAND VCASS (VISUALLY COUPLED AIRBORNE SYSTEMS SIMULATOR) HELMET-MOUNTED DISPLAY Final Report, Nov. 1981 - Feb. 1983
R. A. Buchroeder Wright-Patterson AFB, Ohio AMRL Oct. 1983 133 p
(Contract F33615-79-C-0503; AF Proj. 7184)
(AD-A136649; AFAMRL-TR-83-072) Avail: NTIS HC A07/MF A01 CSCL 20/6

Optical design and component testing have been examined for a new wide-angle, helmet-mounted dual-eye display designed by the Farrand Optical Company, Inc., Valhalla, New York, as part of the Visually Coupled Airborne Systems Simulator (VCASS) program. The display uses a Farrand-proprietary technical device called the Pancake Window, and two 19-mm miniature cathode ray tubes that are mounted with their optics on a modified pilot's helmet. The device weighs 2.3 kg (5.1 lb). Separately adjustable monocular displays provide overlapping images for a panoramic display up to 140 deg wide by 60 deg tall. Each eye has its own 15-mm exit pupil and enough eye relief to allow ordinary eyeglasses to be worn. The display is permanently set at zero diopter focus to eliminate parallex. Interpupillary distance is adjustable, while accommodation for different head sizes is provided by altering the helmet liner with simple spacers. Optical quality would allow resolution of 2000 TV lines, and vignetting is nonexistent over most of the field of view. Although the optical design is difficult by conventional standards, optical tests made on the device prove the manufacturability of the optics. Author (GRA)

N84-19351# Canyon Research Group, Inc., Westlake Village, Calif.
DESIGN CRITERIA FOR REDUCING POPPING IN AREA-OF-INTEREST DISPLAYS: PRELIMINARY EXPERIMENTS Final Interim Report, 1 Sep. 1981 - 31 Aug. 1983
K. S. Berbaum Orlando, Fla. Naval Equipment Training Center Sep. 1983 64 p
(Contract N61339-81-C-0105)
(AD-A136769; NAVTRAEQUIPC-81-C-0105-8) Avail: NTIS HC A04/MF A01 CSCL 05/5

A helmet-mounted display being procured for the Navy's Visual Technology Research Simulator will display two computer-generated images of the scene to be viewed by the trainee pilot, the first inset inside the second, following eye direction and showing a higher level of detail version of the scene than the second, low resolution, low detail, wide angle image. Experiments in which spatially and temporally varying sinusoidal bar patterns are displayed on an Optronix Vision Tester suggest that a contrast blend region around the inset will be effective in suppressing the 'popping' of objects and image detail in and out of view as they move across the inset boundary. These experiments also suggest a restriction upon scene modeling which may be helpful in mitigating popping--namely that the largest size of detail associated with a form (the external border between form plus shadow, and background) be changed least. (Internal contours are added or subtracted first.) In further experimentation, focus of attention is shown to have little effect upon perceived popping, but adaptation may have large effects. GRA

N84-19352# Anacapa Sciences, Inc., Santa Barbara, Calif.
THE INTEGRATED MISSION-PLANNING STATION: FUNCTIONAL REQUIREMENTS, AVIATOR-COMPUTER DIALOGUE, AND HUMAN ENGINEERING DESIGN CRITERIA Final Technical Report, Oct. 1981 - Aug. 1983
S. P. Rogers Aug. 1983 109 p Original contains color illustrations
(Contract DAAK80-81-C-0190)

(AD-A136909; REPT-475) Avail: NTIS HC A06/MF A01 CSCL 17/7

This report describes the tasks conducted to provide detailed human factors engineering specifications for the construction and programming of the IMPS and the results of these tasks. The specific project objectives were to define IMPS functional requirements, design IMPS airborne hardware, design IMPS ground-based hardware, and to maximize the aviator-computer compatibility of the IMPS system. The project approach included a literature review, observation of the aviator task performances, interviews with subject matter experts, surveys, perceptual studies, human engineering analyses, detail design specification studies, and dialogue development analyses. The outcome of these efforts is described in terms of an overview of system components and functions, and detailed descriptions of operation of the airborne and ground-based portions of the IMPS system. Each of the major functions of the IMPS system is discussed, and the operational requirements, present deficiencies, IMPS capabilities, and IMPS operating procedures are identified. Appendices to the report provide hardware design criteria and a complete specification of the interactive dialogue system. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-19353*# Pratt and Whitney Aircraft Group, East Hartford, Conn.

PARALLEL PROCESSOR ENGINE MODEL PROGRAM Final Report

Peter McLaughlin Jan. 1984 70 p refs

(Contract NAS3-23283)

(NASA-CR-174641; NAS 1.26:174641; PWA-5896-21) Avail: NTIS HC A04/MF A01 CSCL 21E

The Parallel Processor Engine Model Program is a generalized engineering tool intended to aid in the design of parallel processing real-time simulations of turbofan engines. It is written in the FORTRAN programming language and executes as a subset of the SOAPP simulation system. Input/output and execution control are provided by SOAPP; however, the analysis, emulation and simulation functions are completely self-contained. A framework in which a wide variety of parallel processing architectures could be evaluated and tools with which the parallel implementation of a real-time simulation technique could be assessed are provided. Author

N84-19354# Naval Postgraduate School, Monterey, Calif.

PRELIMINARY ASSESSMENT OF A ROTARY DETONATION ENGINE CONCEPT M.S. Thesis

S. A. Monks Sep. 1983 114 p

(AD-A137492) Avail: NTIS HC A06/MF A01 CSCL 21/5

Results of a preliminary, experimental assessment of a rotary detonation engine concept are reported. Measurements were taken of the torque produced by a stationary rotor model as a result of a single detonation process initiated within the rotor under known premixed gas conditions. Mixtures of ethylene and oxygen and ethylene and oxygen with three moles of nitrogen ballast were utilized. The results represent the lower bound to values of torque produced by the rotor model. Modifications of the instrumentation and torque measurement system are recommended to allow the transient process and resulting torque to be measured in greater detail, a comparison to be made with the results of numerical modeling, and a definitive assessment of the potential of the concept to be concluded. GRA

N84-19355# National Aerospace Lab., Amsterdam (Netherlands). Construction and Materials Div.

CORROSION AND CORROSION PREVENTION IN GAS TURBINES

A. J. A. Mom and H. J. Kolkman 30 Sep. 1982 42 p refs In DUTCH; ENGLISH summary Presented at Corrosiedag 1982, Arnhem, Netherlands, 14 Sep. 1982

(NLR-MP-82048-U) Avail: NTIS HC A03/MF A01

The conditions governing the corrosion behavior in gas turbines are surveyed. Factors such as temperature, relative humidity, the presence of sulfur and nitrogen dioxide, and fuel quality are discussed. Electromechanical corrosion at relatively low temperature in compressors; oxidation; and hot corrosion (sulfidation) at high temperature in turbines are considered. Corrosion prevention by washing and rinsing, fuel additives, and corrosion resistant materials and coatings is reviewed. Author (ESA)

N84-19901# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.

INVESTIGATION OF THE ACOUSTIC CHARACTERISTICS OF AIRCRAFT/ENGINES OPERATING IN A DRY-COOLED JET ENGINE MAINTENANCE TEST FACILITY

V. R. Miller, G. A. Pizak, J. M. Chinn, and R. J. Reilly *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 105-114 refs (For primary document see N84-19893 10-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 21/5

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-19356# Litton Technische Werke, Freiburg (West Germany).

DEVELOPMENT OF A REDUNDANT COMPUTER SYSTEM FOR FLIGHT AUGMENTATION Final Report, Apr. 1983

Gerhard Herrscher, Bertold Kirst, Dieter Schmidt, and Joachim Szlachta Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 130 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-83-027; ISSN-0170-1339) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 27,50

A fault-tolerant airborne computer system for time-critical process control applications is described. It guarantees real-time processing continuity in the event of hardware failures. The redundancy is hierarchically graded. The structure comprises a bus-coupled homogenous multicomputer system based on a redundant modular design. Fault detection techniques, fault diagnosis, reconfiguration, and development of process control and communication in a decentrally organized multiprocessor system are discussed. The design of a functional model and reliability estimates are outlined. Author (ESA)

N84-19357# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

LECTURE NOTES ON AIRPLANE STABILITY AND CONTROL 1, PART 1

O. H. Gerlach May 1983 268 p refs 2 Vol.

(VTH-LR-384-Pt-1) Avail: NTIS HC A12/MF A01

Airplane aerodynamic moments, equilibrium, static stability, control characteristics in steady flight, and dynamic longitudinal and lateral stability are discussed. The aerodynamic center and moment about the aircraft of the wing with fuselage and nacelles; equilibrium in steady, symmetric straight flight; static longitudinal stability with stick free and fixed; longitudinal control in pull up

maneuvers and steady turns; steady, asymmetric flight; and the equations of motion of an airplane are covered. Author (ESA)

N84-19358# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
LECTURE NOTES ON AIRPLANE STABILITY AND CONTROL 1, PART 2
O. H. Gerlach May 1983 268 p refs 2 Vol.
(VTH-LR-384-Pt-2) Avail: NTIS HC A12/MF A01

Airplane aerodynamic moments, equilibrium, static stability, control characteristics in steady flight, and dynamic longitudinal and lateral stability are discussed. The aerodynamic center and moment about the aircraft of the wing with fuselage and nacelles; equilibrium in steady, symmetric straight flight; static longitudinal stability with stick free and fixed; longitudinal control in pull up maneuvers and steady turns; steady, asymmetric flight; and the equations of motion of an airplane are covered. Author (ESA)

N84-19906# National Space Development Agency, Tokyo (Japan).
EVALUATION OF MODAL TESTING TECHNIQUES FOR SPACECRAFT STRUCTURES
Kuniaki Shiraki and Hidehiko Mitsuma *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 161-170 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 22B

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-19359*# National Aeronautics and Space Administration, Washington, D. C.
USE OF ADAPTIVE WALLS IN 2D TESTS
J. P. Archambaud and J. P. Chevallier Feb. 1984 35 p refs Transl. into ENGLISH from AGARD Conf. on Wall Interference in Wind Tunnels (France), AGARD-CP-335, Sep. 1982 14 p Conf. held in Neuilly Sur Seine (France), Sep. 1982 Previously announced as A82-42813 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77380; NAS 1.15:77380) Avail: NTIS HC A03/MF A01 CSCL 14B

A new method for computing the wall effects gives precise answers to some questions arising in adaptive wall concept applications: length of adapted regions, fairings with up and downstream regions, residual misadjustments effects, reference conditions. The acceleration of the iterative process convergence and the development of an efficient technology used in CERT T2 wind tunnels give in a single run the required test conditions. Samples taken from CAST 7 tests demonstrate the efficiency of the whole process to obtain significant results with considerations of tridimensional case extension. Author

N84-19360*# Virginia Univ., Charlottesville. Dept. of Electrical Engineering.
CARRIER RECOVERY METHODS FOR A DUAL-MODE MODEM: A DESIGN APPROACH
Charles W. Richards and Stephen G. Wilson Mar. 1984 104 p refs
(Grant NAG3-3161)
(NASA-CR-173356; NAS 1.26:173356; UVA/528219/EE84/102) Avail: NTIS HC A06/MF A01 CSCL 01E

A dual mode model with selectable QPSK or 16-QASK modulation schemes is discussed. The theoretical reasoning as well as the practical trade-offs made during the development of a modem are presented, with attention given to the carrier recovery method used for coherent demodulation. Particular attention is given to carrier recovery methods that can provide little degradation due to phase error for both QPSK and 16-QASK, while being insensitive to the amplitude characteristic of a 16-QASK modulation scheme. A computer analysis of the degradation is symbol error rate (SER) for QPSK and 16-QASK due to phase error is prresented. Results find that an energy increase of roughly 4 dB is needed to maintain a SER of 1X10(-5) for QPSK with 20 deg of phase error and 16-QASK with 7 deg phase error. Author

N84-19361# Cranfield Inst. of Tech., Bedfordshire (England). Dept. of Aerodynamics.
AN EVALUATION OF A MOBILE AERODYNAMIC TEST FACILITY FOR HANG GLIDER WINGS
E. A. Kilkenny Nov. 1983 123 p
(CofA-8330; ISBN-0902-937-92-8) Avail: NTIS HC A06/MF A01

The size and flexible nature of hang glider wings makes it difficult to use conventional wind tunnel techniques to evaluate their aerodynamic characteristics. As an alternative, a mobile test facility was developed and an evaluation of this facility is detailed. Each component of the instrumentation is calibrated individually. This is followed by an overall evaluation using data obtained from tests on a rigid wing in a wind tunnel and on the mobile facility. The results confirm the feasibility of such a system and that resulting data is acceptable for investigations into hang glider aerodynamic and stability characteristics. Author

N84-19362*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMULATION APPLICATIONS AT NASA AMES RESEARCH CENTER
Mamoru Inouye Mar. 1984 21 p refs
(NASA-TM-85846; A-9503; NAS 1.15:85846) Avail: NTIS HC A02/MF A01 CSCL 14B

Aeronautical applications of simulation technology at Ames Research Center are described. The largest wind tunnel in the world is used to determine the flow field and aerodynamic characteristics of various aircraft, helicopter, and missile configurations. Large computers are used to obtain similar results through numerical solutions of the governing equations. Capabilities are illustrated by computer simulations of turbulence, aileron buzz, and an exhaust jet. Flight simulators are used to assess the handling qualities of advanced aircraft, particularly during takeoff and landing. Author

N84-19363# Air Force Human Resources Lab., Brooks AFB, Tex. Operations Training Div.
AIRCRAFT SIMULATOR: MULTIPLE-COCKPIT COMBAT MISSION TRAINER NETWORK Final Technical Paper
John A. Cicero Jan. 1984 30 p
(AF Proj. 2743)
(AD-A137182; AFHRL-TP-83-46) Avail: NTIS HC A03/MF A01 CSCL 01/3

The feasibility of a multiple-cockpit combat mission trainer (CMT) aircraft simulator is investigated. It is shown that a cable network can be used to connect many CMTs over a large geographical area. The cable channel is divided into a critical portion and noncritical portion. The critical portion uses a time division multiple access (TDMA) technique to broadcast CMT position and attitude to all other CMTs in the network. The noncritical data portion uses a random access protocol to broadcast weather, threat information, etc. An analysis technique is presented which easily evaluates the random access protocol. Suggestions for further research in this area are proposed. Author (GRA)

N84-19364# Naval Postgraduate School, Monterey, Calif.
DESIGN AND TESTING OF SCALED EJECTOR-DIFFUSERS FOR JET ENGINE TEST FACILITY APPLICATIONS M.S. Thesis
J. W. Molloy Sep. 1983 142 p
(AD-A136745) Avail: NTIS HC A07/MF A01 CSCL 14/2

Design, fabrication and cold flow testing of a modeled jet engine test facility were conducted in an effort to provide an

inexpensive vehicle to study geometric variations in diffuser geometry which could improve system efficiency. The design, which is based on Mach number similitude, consists of two configurations currently in use at the Naval Air Propulsion Center, Trenton, NJ. A constant area diffuser and a variable area diffuser with translating centerbody were modeled. Baseline mapping of the operating characteristics for each diffuser with representative scaled engines was conducted to provide a reference against which alternative geometries would be evaluated. The constant area plus two variants were tested. A five-sixths and two-thirds reduction were studied to investigate the potential for increasing efficiency for a specific engine diffuser combination at NAPC. Secondary flow provisions were incorporated into the design to allow variation of this parameter. The modeling results were consistent with theory and the test apparatus produced repeatable results. A two dimensional double ramp (wedge) capable of being translated in a rectangular duct was suggested as an alternative diffuser geometry. GRA

N84-19365# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DYNAMIC CHARACTERISTICS OF A JET ENGINE TEST FACILITY AIR SUPPLY M.S. Thesis
M. L. Ross Dec. 1983 154 p
(AD-A136910; AFIT/GAE/AA/83D-20) Avail: NTIS HC A08/MF A01 CSCL 20/4

Dynamic response of a scale model of the Aeropropulsion Systems Test Facility (ASTF) air supply ducting was determined experimentally over a frequency range from 20-200 Hz. Blocked lines with no flow and orifice terminated lines with a mean flow were used. The experiments examined the effects of signal input on three different lines and of using different size venturis. Gain and phase were measured upstream of the venturi and at the end of the line. Experimental results were compared with the results of a computer program based on Nichols' theory as modified by Krishnaiyer and Lechner. With few exceptions, the gains were predicted within + or - 5 dB, and phase angles within + or - 10%. This agreement between theory and experiment verified that the theory can be applied successfully to large, complex systems and that the computer program was running properly. The verified program was then applied to the full-scale ASTF air supply and results analyzed. The ASTF results show higher gains at low frequencies and no reduction in the average gain with frequency. This was as expected for the large ASTF ducting, which ranges from 4-22 ft in diameter. GRA

N84-19366# Coordinating Research Council, Inc., Atlanta, Ga.
ELECTROSTATIC CHARGING TEST FOR AVIATION FUEL FILTERS
Nov. 1983 88 p
(AD-A136986; CRC-534) Avail: NTIS HC A05/MF A01 CSCL 13/11

The objective of the field test program was the measurement of filter charging levels in actual aircraft fueling (hydrant cart) equipment to provide correlation data for the laboratory charging test program. The field test location and equipment were selected to provide a high total fuel throughput under typical refueling conditions. The designated hydrant carts were equipped with new separator elements supplied from specific batches by two major manufacturers. Periodic electrostatic charging measurements were conducted over a range of typical refueling conditions, which could be approximated in the laboratory program. New and used filter elements from the selected batches and representative fuel samples were provided to the laboratory program for correlative measurements. GRA

N84-19367# Naval Training Equipment Center, Orlando, Fla.
PREDICTOR DISPLAYS AS TRAINING AIDS IN CARRIER LANDINGS
D. R. Weller Nov. 1983 20 p
(NR Proj. F57-526)
(AD-A136643; NAVTRAEQUIPC-TN-66) Avail: NTIS HC A02/MF A01 CSCL 05/9

This report presents an evaluation of the effectiveness of predictor displays as training aids in carrier landing. An experiment was performed in which two predictor displays were compared with a control condition, where the principal measure was total approaches necessary to reach criterion performance. Also evaluated were three presentation modes for the predictor displays. The experiment was carried out on a low-cost device which simulated an A-7 aircraft. Analysis of the data indicated no significant differences between groups; although one predictor display consistently yielded better performance than the other conditions. Author (GRA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-19368*# Stanford Telecommunications, Inc., McLean, Va.
STUDY OF A TRACKING AND DATA ACQUISITION SYSTEM (TDAS) IN THE 1990'S Quarterly Technical Progress Report
21 Nov. 1981 148 p refs Sponsored in part by Fairchild Space and Electronics Co. and Space Communications Co.
(Contract NAS5-26546)
(NASA-CR-173262; NAS 1.26:173262; STI/E-TR-9109; QTPR-2)
Avail: NTIS HC A07/MF A01 CSCL 22A

Progress in concept definition studies, operational assessments, and technology demonstrations for the Tracking and Data Acquisition System (TDAS) is reported. The proposed TDAS will be the follow-on to the Tracking and Data Relay Satellite System and will function as a key element of the NASA End-to-End Data System, providing the tracking and data acquisition interface between user accessible data ports on Earth and the user's spaceborne equipment. Technical activities of the 'spacecraft data system architecture' task and the 'communication mission model' task are emphasized. The objective of the first task is to provide technology forecasts for sensor data handling, navigation and communication systems, and estimate corresponding costs. The second task is concerned with developing a parametric description of the required communication channels. Other tasks with significant activity include the 'frequency plan and radio interference model' and the 'Viterbi decoder/simulator study'. M.G.

N84-19369*# Stanford Telecommunications, Inc., McLean, Va.
TRACKING AND DATA ACQUISITION SYSTEM FOR THE 1990'S. VOLUME 1: EXECUTIVE SUMMARY Draft Final Report
Robert Daly and Leonard Schuchman 31 May 1983 91 p refs
(Contract NAS5-26546)
(NASA-CR-175193; NAS 1.26:175193; STI/E-TR-25066-Vol-1)
Avail: NTIS HC A05/MF A01 CSCL 22A

Requirements tracking and data acquisition system (TDAS) space and ground segments, and TDAS navigation are discussed. N.W.

N84-19370*# Stanford Telecommunications, Inc., McLean, Va.
STUDY OF A TRACKING AND DATA ACQUISITION SYSTEM FOR THE 1990'S. VOLUME 1: USER COMMUNITY CHARACTERISTICS Draft Final Report
Terrence McCreary 30 Nov. 1981 198 p refs Prepared in cooperation with Fairchild Space and Electronic Co. and Space Communications Co.
(Contract NAS5-26546)
(NASA-CR-175194; NAS 1.26:175194; STI/E-TR-25066-Vol-2)
Avail: NTIS HC A09/MF A01 CSCL 22A

Projected 1990's experiments; navigation requirements and potentials; communications requirements associated with space experiments; alternative forecast options; and operational impacts on experiments are covered. A baseline of plans for the TDAS User Community, including a set of generic experiments developed to supplement existing planning for the 1990's time frame is generated. It includes extensive summaries of collected data, and

a bibliography. The data are representative of inputs obtained from NASA planning sources through September 1981. Author

N84-19371*# Stanford Telecommunications, Inc., McLean, Va.
STUDY OF A TRACKING AND DATA ACQUISITION SYSTEM FOR THE 1990'S. VOLUME 3: TDAS COMMUNICATION MISSION MODEL Draft Final Report
Terrence McCreary 31 May 1983 122 p refs Prepared in cooperation with Space Communications Co., Gaithersburg, Md.
(Contract NAS5-26546)
(NASA-CR-175195; NAS 1.26:175195; STI/E-TR-25066-Vol-3)
Avail: NTIS HC A06/MF A01 CSCL 22A

A parametric description of the communication channels required between the user spacecraft to be supported and the user ground data systems is developed. Scenarios of mission models, which reflect a range of free flyers vs space platform usage as well as levels of NASA activity and potential support for military missions, and potential channel requirements which identify: (1) bounds on TDAS forward and return link data communication demand, and (2) the additional demand for providing navigation/tracking support are covered. Author

N84-19372*# Stanford Telecommunications, Inc., McLean, Va.
STUDY OF TRACKING AND DATA ACQUISITION SYSTEM FOR THE 1990'S. VOLUME 4: TDAS SPACE SEGMENT ARCHITECTURE Draft Final Report
Richard S. Orr 31 May 1984 190 p refs
(Contract NAS5-26546)
(NASA-CR-175212; NAS 1.26:175212; STI/E-TR-25066-Vol-4)
Avail: NTIS HC A09/MF A01 CSCL 22A

Tracking and data acquisition system (TDAS) requirements, TDAS architectural goals, enhanced TDAS subsystems, constellation and networking options, TDAS spacecraft options, crosslink implementation, baseline TDAS space segment architecture, and treat model development/security analysis are addressed. Author

N84-19373*# Stanford Telecommunications, Inc., McLean, Va.
TRACKING AND DATA ACQUISITION SYSTEM FOR THE 1990'S. VOLUME 5: TDAS GROUND SEGMENT ARCHITECTURE AND OPERATIONS CONCEPT Draft Final Report
Robert Daly 31 May 1983 176 p refs
(Contract NAS5-26546)
(NASA-CR-175197; NAS 1.26:175197; STI/E-TR-25066-Vol-5)
Avail: NTIS HC A09/MF A01 CSCL 22A

Tracking and data acquisition system (TDAS) ground segment and operational requirements, TDAS RF terminal configurations, TDAS ground segment elements, the TDAS network, and the TDAS ground terminal hardware are discussed. Author

N84-19374*# Stanford Telecommunications, Inc., McLean, Va.
TRACKING DATA ACQUISITION SYSTEM (TDAS) FOR THE 1990'S. VOLUME 6: TDAS NAVIGATION SYSTEM ARCHITECTURE Draft Final Report
Bryant D. Elrod, Alan Jacobsen, Ronald A. Cook, and Ram-Nandan P. Singh 31 May 1983 231 p refs
(Contract NAS5-26546)
(NASA-CR-175198; NAS 1.26:175198; STI/E-TR-25066-Vol-6)
Avail: NTIS HC A11/MF A01 CSCL 22A

One-way range and Doppler methods for providing user orbit and time determination are examined. Forward link beacon tracking, with on-board processing of independent navigation signals broadcast continuously by TDAS spacecraft; forward link scheduled tracking; with on-board processing of navigation data received during scheduled TDAS forward link service intervals; and return link scheduled tracking; with ground-based processing of user generated navigation data during scheduled TDAS return link service intervals are discussed. A system level definition and requirements assessment for each alternative, an evaluation of potential navigation performance and comparison with TDAS mission model requirements is included. TDAS satellite tracking is also addressed for two alternatives: BRTS and VLBI tracking. Author

N84-19375*# Stanford Telecommunications, Inc., McLean, Va.
TRACKING AND DATA ACQUISITION SYSTEM FOR THE 1990'S. VOLUME 7: TDAS SPACE TECHNOLOGY ASSESSMENT Draft Final Report
Ram Khatri 31 May 1983 379 p refs
(Contract NAS5-26546)
(NASA-CR-175199; NAS 1.26:175199; STI/E-TR-25066-Vol-7)
Avail: NTIS HC A17/MF A01 CSCL 22A

The results of the TDAS and user spacecraft technology assessment effort are provided. For each TDAS Satellite enhancement and user spacecraft element previously enumerated, the technology issues are identified and the R&D needed to resolve these issues is delineated. Subsequently, taking into account developments taking place elsewhere, the addition unique TDAS satellite module and user spacecraft element R&D efforts needed are identified, and conclusions are drawn in each case. From these conclusions, it is evident that with additional unique R&D efforts carried out for TDAS and appropriate user spacecraft elements the desired TDAS' capabilities for the 1990's can be realized and user spacecraft can be implemented that adequately interface with the projected TDAS. Author

N84-19376*# Stanford Telecommunications, Inc., McLean, Va.
TRACKING AND DATA ACQUISITION SYSTEM FOR THE 1990'S. VOLUME 8: TDAS FREQUENCY PLANNING Draft Final Report
Stephen B. Heppe and Bryant D. Elrod 31 May 1983 80 p refs
(Contract NAS5-26546)
(NASA-CR-175200; NAS 1.26:175200; STI/E-TR-25066-Vol-8)
Avail: NTIS HC A05/MF A01 CSCL 22A

Current planning calls for the TDAS to support new user and crosslink services, in addition to TDRSS-compatible services. TDRSS-compatible services would operate in current S-band and K-band channels used by TDRSS. New services, however, can take advantage of technology advances at microwave and optical frequencies. For augmented space-to-space services, 60 GHz and GaAs laser systems offer technical advantages, relative freedom from RFI, and a benign regulatory environment (i.e., minimal congestion and, in the case of 60 GHz, maximum regulatory support for TDAS-type services). For TDAS Earth-to-space and space-to-Earth services, the 30/20 GHz band offers the best mix of technical and regulatory advantages. But use of these bands would have to be coordinated with the U.S. military. Author

N84-19377*# General Dynamics/Convair, Fort Worth, Tex.
DEFINITION OF TECHNOLOGY DEVELOPMENT MISSIONS FOR EARLY SPACE STATIONS ORBIT TRANSFER VEHICLE SERVING. PHASE 2, TASK 1: SPACE STATION SUPPORT OF OPERATIONAL OTV SERVICING
Dec. 1983 245 p refs
(Contract NAS8-35039)
(NASA-CR-170984; NAS 1.26:170984; GDC-SP-83-067) Avail: NTIS HC A11/MF A01 CSCL 22A

Representative space based orbital transfer vehicles (OTV), ground based vehicle turnaround assessment, functional operational requirements and facilities, mission turnaround operations, a comparison of ground based versus space based tasks, activation of servicing facilities prior to IOC, fleet operations requirements, maintenance facilities, OTV servicing facilities, space station support requirements, and packaging for delivery are discussed. N.W.

N84-19378*# National Aeronautics and Space Administration, Washington, D. C.
PUBLIC ANNOUNCEMENT OF FLIGHT OPPORTUNITY FOR MATERIALS SCIENCE EXPERIMENTS ON THE SPACELAB MISSION D1: EXTRACT
Jan. 1983 20 p Transl. into ENGLISH of DFVLR e.v., Hauptableilung Shuttle-Spacelab-Nutzung, Linder Hohe (West Germany), 19 Apr. 1982 p 1-12 Transl. by the Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77277; NAS 1.15:77277) Avail: NTIS

HC A02/MF A01 CSCL 22A

Engineering descriptions of the double ellipsoid reflector furnace, the single ellipsoid reflector furnace, the isothermic heating facility, the gradient furnace with quenching equipment and cryostat to be flown on the Spacelab Mission D-1 are provided. Author

N84-19379# Technische Univ., Berlin (West Germany). Fachgebeit Raumfahrttechnik.

DESIGN OF A PROJECT PLAN FOR THE ESTABLISHMENT OF A LUNAR FACTORY [ENTWURF EINES PROJEKTPLANES FUER DIE ERRICHTUNG EINER MONDFABRIK]

Heinz-Hermann Koelle, Ulrich Thomas, Uwe Apel, Ralf Balzer, Detelef Bernau, Juergen Czarnitzki, Amnon Ginati, Olaf Heiden, Joern Ryba, and Bernd Schulz 15 Aug. 1983 58 p refs In GERMAN; ENGLISH summary

(ILR-Mitt-123) Avail: NTIS HC A04/MF A01

A project for a lunar factory producing feedstock and construction material for the manufacturing of space solar power plants, and large quantities of liquid oxygen for propulsion is outlined. A systems description, a time schedule, a cost plan and a proposal for an organization to carry out such a project are presented. Benefits and risks are discussed. It is shown that such a lunar factory could be ready by the year 2002 and deliver simple products at cost of 5 to 10 $/kg. Author (ESA)

N84-19445# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).

EIGHT YEARS OF IN ORBIT EXPERIENCE WITH THE HELIOS SOLAR PROBE THERMAL CONTROL SUBSYSTEM

K. Beckmann *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 419-424 refs (For primary document see N84-19396 10-18)

Avail: NTIS HC A25/MF A01

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N84-19380# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A SEMIANALYTIC METHOD OF ORBITAL PROPAGATION FOR MISSION ANALYSIS [UM METODO SEMI-ANALITICO DE PROPAGACAO DE ORBITAS PARA ANALISE DE MISSOES]

Valder Matos deMedeiros May 1983 10 p refs In PORTUGUESE; ENGLISH summary Presented at the 7th Brazilian Congr. of Mech. Engr., Uberlandia, Brazil, 13-16 Dec. 1983

(INPE-2748-PRE/324) Avail: NTIS HC A02/MF A01

A version of semi-analytical methods for orbital propagation, applied basically in mission analysis for close Earth satellites is presented. The method consists of the application of the Taylor series expansion, in the secular variation elements to improve the accuracy of the propagation of the mean elements of the orbit. These elements take quadratic polynomical form, where the quadratic coefficients appear as coupling of the geopotential with the other perturbations. Author

N84-19381# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

ORBITAL MOTION OF A FREELY CONING SOLAR SAIL M.S. Thesis

K. L. Jenkins Dec. 1983 75 p

(AD-A136794; AFIT/GA/AA/83D-3) Avail: NTIS HC A04/MF A01 CSCL 22/3

This paper addresses orbital perturbations in the two-body problem of an Earth-orbiting solar sail undergoing free coning motion in a circular orbit. The coning motion controls both the magnitude and direction of the solar radiation pressure force. The equations of motion are expanded from the Language planetary equations in their acceleration component form and are solved assuming small changes in the orbital elements over the period of one orbit. Resonances are observed between the mean motion of the sail and its precession rate. The one-to-one resonance case is examined and numerical methods are employed to verify the analytic results for the circular orbit case. Author (GRA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-19382*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SPACELAB DATA PROCESSING FACILITY

[1983] 27 p refs Original document contains color illustrations (NASA-TM-85556; NAS 1.15:85556) Avail: NTIS HC A03/MF A01 CSCL 14B

The Spacelab Data Processing Facility (SDPF) processes, monitors, and accounts for the payload data from Spacelab and other Shuttle missions and forwards relevant data to various user facilities worldwide. The SLDPF is divided into the Spacelab Input Processing System (SIPS) and the Spacelab Output Processing System (SOPS). The SIPS division demultiplexes, synchronizes, time tags, quality checks, accounts for the data, and formats the data onto tapes. The SOPS division further edits, blocks, formats, and records the data on tape for shipment to users. User experiments must conform to the Spacelab's onboard High Rate Multiplexer (HRM) format for maximum process ability. Audio, analog, instrumentation, high density, experiment data, input/output data, quality control and accounting, and experimental channel tapes along with a variety of spacelab ancillary tapes are provided to the user by SLDPF. M.A.C.

N84-19401# European Space Agency, Paris (France).

THERMAL CYCLING TESTS IN SPACE ENVIRONMENT SIMULATION CHAMBERS [LES ESSAIS DE CYCLAGES THERMIQUES DANS LES CHAMBRES DE SIMULATION SPATIALE]

C. Poux (Intespace, Toulouse) *In its* Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 39-42 In FRENCH (For primary document see N84-19396 10-18)

Avail: NTIS HC A25/MF A01

N84-19458# European Space Research and Technology Center, Noordwijk (Netherlands).

THE LARGE SPACE SIMULATOR (LSS) AT ESA/ESTEC (A SUMMARY OF THE MAIN CHARACTERISTICS)

P. W. Brinkmann *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 501-503 refs (For primary document see N84-19396 10-18)

Avail: NTIS HC A25/MF A01

N84-19460# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).

THE NEW SPACE SIMULATION AND THERMAL VACUUM FACILITY WSA/TVA

H. E. Nuss and J. Reimann *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 521-526 (For primary document see N84-19396 10-18)

Avail: NTIS HC A25/MF A01

N84-19635*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

FIRST RESULTS OF GPS TIME TRANSFER TO AUSTRALIA

J. McK.Luck (ACT, Canberra, Australia), J. R. Woodger (ACT, Canberra, Australia), J. E. Wells (ACT, Tidbinbella, Australia), P. N. Churchill (ACT, Tidbinbella, Australia), and P. A. Clements *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984

p 141-160 refs (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 14B

N84-19876# Sandia Labs., Albuquerque, N. Mex.
AN EXPLOSIVE DRIVEN SHOCK TUBE FOR VERIFYING SURVIVAL OF RADIOISOTOPE HEAT SOURCES DURING SPACE SHUTTLE LAUNCH ACCIDENT
F. H. Mathews *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 103-115 refs (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 14/2

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-19383# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CAPTURE OF SATELLITE STABILIZED BY GRAVITY GRADIENT WITH A FLEXIBLE MAST DURING AND AFTER DEPLOYMENT [ANALISE DO PROBLEMA DE CAPTURA DE UM SATELITE ESTABILIZADO POR GRADIENTE DE GRAVIDADE COM MASTRO FLEXIVEL DURANTE E APOS A FASE DE ESTICAMENTO]
Donizeti Leonel Ferreira, Paulo Tadeu de Milleo Lourencao, and Santiago Alves Tavares May 1983 11 p refs In PORTUGUESE; ENGLISH summary Presented at the 7th Brazilian Congr. of Mech. Engr., COBEM 83, Uberlandia, Brazil, 13-16 Dec. 1983
(INPE-2749-PRE/325) Avail: NTIS HC A02/MF A01

The capture of the nominal equilibrium position of a gravity gradient stabilized satellite with flexible and extensible appendages is considered. The initial conditions, for which the capture is possible, are studied noting that there is a large variation in the parameters such as deployment velocity center of massa positions, etc. The objective is to evaluate the influence of the boom flexibility on the librational movement of the rigid body. The study is based on the Lagrangena formulation and on the method of assumed modes. Author

N84-19384# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
SATELLITE ATTITUDE STABILITY PROVIDED BY A ROTOR SUBJECTED TO DIFFICULT OPERATING CONDITIONS [ESTABILIDADE DE ATITUDE DE UM SATELITE MUNIDO DE ROTOR SUJEITO A DIFERENTES CONDICOES DE OPERACAO]
Luis Novaes Ferreira Franca and Pauloo Tadeu de Mello Lourencao May 1983 11 p refs In PORTUGUESE; ENGLISH summary Presented at the 7th Brazilian Congr. of Mech. Eng., Uberlandia (Brazil), 13-16 Dec. 1983
(INPE-2747-PRE/323) Avail: NTIS HC A02/MF A01

The attitude stability of a rigid gravity gradient satellite containing a rotor is analyzed. The rotor can be operated in two different ways. In the first case, its angular velocity is kept constant. In the second, the rotor is free to rotate. These cases are respectively known as "restrained' and "free'. Using different Liapunov functions like the Hamiltonian or a combination of first integrals, the stability conditions are derived and compared.Author

N84-19385# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CHANGING GAIN VERSUS AREA OF STABILITY FOR A SCALAR, MODAL CONTROLLER M.S. Thesis
Gaylord H. Liby Dec. 1983 53 p
(AD-A136804; AD-E301284; AFIT/GA/AA/83D-5) Avail: NTIS HC A04/MF A01 CSCL 22/3

A periodic orbit is developed and controlled, and the relationship between controller gain and area of stability is determined using mathematical experiments. The equations of variation are developed about an unstable, periodic orbit and the single, unstable mode of the variations is controlled with a controller developed using Floquet theory. The Surfaces of Section technique is presented as a tool with which to graphically determine the area of the state space in which the controller provides stability. The investigation shows that there exists a controller gain which provides a maximum area of stability when the (Calico-Wiesel) controller is applied to a set of nonlinear, time-periodic equations. It is also shown that in the application of the controller, the user can select a variable gain such that the area in which the controller provides stability is maximized for the available controller gain choices. Author (GRA)

N84-19386# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A MODEL FOR EVALUATION OF SATELLITE POPULATION MANAGEMENT ALTERNATIVES M.S. Thesis
R. E. Penny, Jr. and R. K. Jones Dec. 1983 144 p
(AD-A136886; AFIT/GSO/AA/83D-1) Avail: NTIS HC A07/MF A01 CSCL 22/2

A Q-GERT model was developed to simulate the satellite environment, including the untracked man-made population, and to calculate a probability of collision for any satellite of interest. Provision for launches, explosions, collisions (including ASAT), retrieval, reposition, and decay was made. The model is structured to easily vary the rates at which these activities occur and to observe changes in the satellite population through which a satellite of interest must travel. Variance of the rates, and the resultant change in probability of collision allows evaluation of satellite population management alternatives such as reducing launch rates or increasing retrieval of spent, but still capable of exploding, satellites. The model is proposed for use by both the USAF SPACE COMMAND and NASA. GRA

N84-19387# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MORE OPTIMAL SEARCHES
L. G. Taff and P. M. S. Randall 17 Nov. 1983 35 p
(Contract F19628-80-C-0002; AF Proj. 2698; AF Proj. 2295)
(AD-A136934; ETS-70; ESD-TR-83-070) Avail: NTIS HC A03/MF A01 CSCL 22/3

Specific application is made to searches for near-stationary artificial satellites and to the classical along orbit search. These two reflect different limiting cases for the a priori target distribution (uniform for the near-stationary case) and the conditional detection probability (uniform for the along orbit case). Our treatment of the near-stationary case is as realistic as is currently possible. Atmospheric extinction, eclipses, and phase effects are all included. Similarly we have explored a variety of scenarios for the along orbit search. We conclude with explicit search plan construction and illustrative examples. Finally we mention other work in this area currently underway. GRA

N84-19388# Army Engineer Topographic Labs., Fort Belvoir, Va.
ON GENERATION, ESTIMATION, UTILIZATION, AVAILABILITY AND COMPATIBILITY ASPECTS OF GEODETIC AND METEOROLOGICAL DATA
H. B. vonLuetzow Aug. 1983 22 p Presented at the 18th Interdisciplinary Symp. Data Management, Intern. Union of Geodesy and Geophys. General Assembly, Hamburg, 15-27 Aug. 1983
(AD-A135844; ETL-R053) Avail: NTIS HC A02/MF A01 CSCL 22/2

Following an introduction, the paper discusses in section 2 the collection or generation of final geodetic data from conventional surveys, satellite observations, satellite altimetry, the Global Positioning System, and moving base gravity gradiometers. Section 3 covers data utilization and accuracy aspects including gravity programmed inertial positioning and subterraneous mass detection. Section 4 addresses the usefulness and limitation of the collocation method of physical geodesy. Section 5 is concerned with the computation of classical climatological data. In section 6, meteorological data assimilation is considered. Section 7 deals with correlated aspects of initial data generation with emphasis on initial wind field determination, parameterized and classical hydrostatic prediction models, non-hydrostatic prediction, computational

networks, and computer capacity. The paper concludes that geodetic and meteorological data are expected to become increasingly more diversified and voluminous both regionally and globally, that its general availability will be more or less restricted for some time to come, that its quality and quantity are subject to change, and that meteorological data generation, accuracy and density have to be considered in conjunction with advanced as well as cost-effective numerical weather prediction models and associated computational efforts. GRA

N84-19398# Aeritalia S.p.A., Torino (Italy).
DEVELOPMENT OF A SPACECRAFT INFRARED TEST TECHNIQUE AS AN ALTERNATIVE TO SOLAR SIMULATION: FIRST STEPS ON L-SAT THERMAL MODEL
P. Messidoro, D. Boggiatto, M. Pataccia, and P. Buratti *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 11-17 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19408# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
THERMAL CONTROL DESIGN OF ISPM
H. Petersen *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 95-102 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19409# Societe Nationale Industrielle Aerospatiale, Cannes (France).
THERMAL CONTROL OF THE EXOSAT EUROPEAN SATELLITE [LE SATELLITE EUROPEEN EXOSAT: SON CONTROLE THERMIQUE]
A. Lanteri *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 103-111 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19410# Saab-Space A.B., Linkoeping (Sweden).
VIKING SATELLITE THERMAL CONTROL ANALYTICAL VERIFICATION AND TEST
B. Moertberg and P. Svensson *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 113-117 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19411# Centre National d'Etudes Spatiales, Toulouse (France).
THERMAL CONTROL OF THE SPOT PLATFORM [LE CONTROLE THERMIQUE DE LA PLATE-FORME]
I. Alet and J. L. Foret (SNIAS, Cannes, France) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 119-125 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19412# European Space Research and Technology Center, Noordwijk (Netherlands).
THERMAL DESIGN OF THE GIOTTO SPACECRAFT
F. Felici and P. Lindhout (Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 127-137 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19413# MATRA Service Aerodynamique, Toulouse (France).
THERMAL CONTROL OF TELECOM 1 [LE CONTROLE THERMIQUE DE TELECOM 1]
J.-F. Arnoult, M. Koedinger (SNIAS, Cannes, France), and A.-M. Pouzet (CNES, Toulouse) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 139-148 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19414# Aeritalia S.p.A., Torino (Italy).
THE THERMAL DESIGN OF L-SAT LARGE TELECOMMUNICATION SATELLITE
D. Boggiatto, E. Colizzi, R. Veneri, and E. Sacchi *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 149-159 refs Sponsored by ESA and British Aerospace Dynamics Group (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19415# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
THERMAL DESIGN AND PERFORMANCE OF THE IRAS SPACECRAFT SYSTEM
P. L. vanLeeuwen *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 163-170 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19444# Aeritalia S.p.A., Torino (Italy). Space Sector.
THERMAL CONTROL OF TETHERED SATELLITE IN A VERY LOW ALTITUDE AERODYNAMIC MISSION
G. Borriello, C. Chiarelli, G. Pellis, and F. Al-Astrabadi *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 407-416 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19446# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
OTS 2: FIVE YEARS OF THERMAL TESTING ON A SATELLITE IN A GEOSTATIONARY ORBIT
D. R. Chalmers, H. G. Konzok, J. P. Bouchez (ESTEC, Noordwijk, Netherlands), and D. Howle (ESTEC, Noordwijk, Netherlands) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 425-436 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19448# Mitsubishi Electric Mfg. Co. Ltd., Amagasaki (Japan).
DEGRADATION OF THERMAL SHIELD MATERIALS IN THE SPACE RADIATION ENVIRONMENT
S. Shimoji, H. Kimura, M. Koitabashi, T. Imamura, R. Kasai, and M. Matsushita (National Space Development Agency, Japan) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 441-446 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19450# European Space Agency, Paris (France).
THERMAL TEST DATA ANALYSIS [METHODES DE DEPOUILLEMENT DES ESSAIS THERMIQUES]
S. Michel (Intespace, Toulouse) *In its* Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 457-459 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19455# Centre National d'Etudes Spatiales, Toulouse (France).
GEOSTATIONARY SATELLITE WITH SUN POINTING PLATFORM AND GEOCENTRIC PAYLOAD [SATELLITE GEOSTATIONNAIRE A PLATE-FORME POINEE SOLEIL ET CHARGE UTILE GEOCENTRIQUE]
I. Alet *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 481-485 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19456# Thomson-CSF, Toulouse (France).
THERMAL CONTROL OF THE SPOT SATELLITE PAYLOAD TELEMETRY [LE CONTROLE THERMIQUE DE LA TMCU DU SATELLITE SPOT]
G. Racaud, B. Dantin, and P. Lelievre *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 487-493 refs In FRENCH; ENGLISH summary (For primary document see

N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19946# Bayerische Akademie der Wissenschaften, Munich (West Germany).
THE OBSERVATION OF ARTIFICIAL SATELLITES AND VLBI
E. Reinhart, H. Seeger, and F. Wilson *In its* Natl. Rept. of the Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 78-109 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-19389*# Texas A&M Univ., College Station. Turbomachinery Labs.
ROTORDYNAMIC CHARACTERISTICS OF THE HPOTP (HIGH PRESSURE OXYGEN TURBOPUMP) OF THE SSME (SPACE SHUTTLE MAIN ENGINE)
Dara W. Childs 30 Jan. 1984 59 p refs
(Contract NAS8-34505)
(NASA-CR-170987; NAS 1.26:170987; RD-1-84) Avail: NTIS HC A04/MF A01 CSCL 20H

Rotational stability of turbopump components in the space shuttle main engine was studied via analysis of component and structural dynamic models. Subsynchronous vibration caused unacceptable migration of the rotor/housing unit with unequal load sharing of the synchronous bearings that resulted in the failure of the High Pressure Oxygen Turbopump. Linear analysis shows that a shrouded inducer eliminates the second critical speed and the stability problem, a stiffened rotor improves the rotordynamic characteristics of the turbopump, and installing damper boost/impeller seals reduces bearing loads. Nonlinear analysis shows that by increasing the 'dead band' clearances, a marked reduction in peak bearing loads occurs. M.A.C.

N84-19390# Industrial Coll. of the Armed Forces, Washington, D.C.
MOBILIZATION AND DEFENSE MANAGEMENT TECHNICAL REPORTS SERIES. MANAGEMENT IMPLICATIONS OF INDUSTRIAL SUPPORT CAPABILITIES FOR SPACE SHUTTLE OPERATIONS
J. F. Reynolds and J. L. Graham, Jr. May 1983 88 p
(AD-A137460; NDU/ICAF-83/013; IR-15) Avail: NTIS HC A05/MF A01 CSCL 22/2

This study examines implications of Space Shuttle logistics support concepts and policies, which have been planned to rely heavily on contractor or vendor support through a substantial portion of the system's operational life, especially in the areas of spares and maintenance. The analysis focuses on the effects of open production lines and the impact on logistics support if production is completed or terminated, with ensuing shutdown of those lines. Unique characteristics of Space Shuttle support in terms of equipment, organizational roles, and funding and cost are identified; and risks associated with both operational support and funding are addressed. Author (GRA)

N84-19391# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
NONLINEAR MODELING AND INITIAL CONDITION ESTIMATION FOR IDENTIFYING THE AEROTHERMODYNAMIC ENVIRONMENT OF THE SPACE SHUTTLE ORBITER M.S. Thesis
C. D. Lutes Dec. 1983 119 p
(AD-A136928; AFIT/GAE/AA/83D-14) Avail: NTIS HC A06/MF A01 CSCL 20/13

This report describes improvements made to the data analysis tool HEATEST, used for identification of the reentry aerothermodynamic environment of the Space Shuttle Orbiter. The heating model was changed from a linear perturbation form to that of a piecewise linear interpolation form to account for nonlinear heating rates. Also, a fixed-point initial condition smoother was incorporated to gain better estimates of unknown initial temperatures. Verification of these modifications was accomplished by applications to both simulated and actual flight test data. Simulations of nonlinear heating rates indicated higher than actual coating thickness predictions for the linear perturbation model previously used. Flight results using the improved heating model provided additional verification of a time skew due to nonisothermal wall effects on the OMS pod. Estimation of initial temperatures using the fixed-point initial condition smoother enabled the identification of an unmodeled Mach or Reynolds number effect on the lower surface during the Mach 12 Pushover Pullup maneuver of STS-4. GRA

N84-19680# Rockwell International Corp., Downey, Calif.
ICE IMPACT TESTING OF SPACE SHUTTLE THERMAL PROTECTION SYSTEM MATERIALS
Paul H. DeWolfe *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 177-182 (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 22/2

N84-19698*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ACOUSTIC ENVIRONMENTS FOR JPL SHUTTLE PAYLOADS BASED ON EARLY FLIGHT DATA
Michael R. OConnell and Dennis L. Kern *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 63-77 refs (For primary document see N84-19893 10-39)
(Contract NAS7-100)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 22B

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N84-19633*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TELEMETRY SIMULATION ASSEMBLY IMPLEMENTATION IN THE DSN
M. E. Alberda *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 120-131 (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 09F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-19392*# Bendix Corp., Teterboro, N. J. Guidance Systems Div.
MODULAR DESIGN ATTITUDE CONTROL SYSTEM Final Report
F. D. Chichester 24 Jan. 1984 71 p refs
(Contract NAS8-33979)

(NASA-CR-175398; NAS 1.26:175398) Avail: NTIS HC A04/MF A01 CSCL 22B

The problem of applying modular attitude control to a rigid body-flexible suspension model of a flexible spacecraft with some state variables inaccessible was addressed by developing a sequence of single axis models and generating a series of reduced state linear observers of minimum order to reconstruct those scalar state variables that were inaccessible. The specific single axis models treated consisted of two, three and four rigid bodies, respectively, interconnected by a flexible shaft passing through the mass centers of the bodies. Reduced state linear observers of all orders up to one less than the total number of scalar state variables were generated for each of the three single axis models cited. Author

N84-19393*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STEADY INTERNAL FLOW AND AERODYNAMIC LOADS ANALYSIS OF SHUTTLE THERMAL PROTECTION SYSTEM

Dennis H. Petley, William Alexander, Jr., George W. Ivey, Jr., and Patricia A. Kerr Mar. 1984 68 p refs

(NASA-TP-2255; L-15695; NAS 1.60:2255) Avail: NTIS HC A04/MF A01 CSCL 22B

An analytical model for calculation of ascent steady state tile loading was developed and validated with wind tunnel data. The analytical model is described and results are given. Results are given for loading due to shocks and skin friction. The analysis included calculation of internal flow (porous media flow and channel flow) to obtain pressures and integration of the pressures to obtain forces and moments on an insulation tile. A heat transfer program was modified by using analogies between heat transfer and fluid flow so that it could be used for internal flow calculation. The type of insulation tile considered was undensified reusable surface insulation (RSI) without gap fillers, and the location studied was the lower surface of the orbiter. Force and moment results are reported for parameter variations on surface pressure distribution, gap sizes, insulation permeability, and tile thickness. Author

N84-19394*# Avco Systems Div., Lowell, Mass.

MAINTENANCE AND OPERATIONAL ENHANCEMENT OF THE FLEXIBLE SPACECRAFT DYNAMICS PROGRAM Final Report

9 Sep. 1983 38 p refs

(Contract NAS5-27466)

(NASA-CR-175211; NAS 1.26:175211) Avail: NTIS HC A03/MF A01 CSCL 22B

The modifications and additions made to the Flexible Spacecraft Dynamics (FSD) Program under contract NAS5-27466 are described. The principal addition to the program was the capability to simulate a two axis gimble platform despin control system using the vibration damper degree of freedom for the azimuth gimble. The details of the modifications made to the FSD Program are presented. Modifications to existing subroutines are briefly described and a detailed description of new subroutines is given. In addition, the program variables in new labelled COMMON blocks are described in detail. New input symbols for the FSD Program are described. Author

N84-19395*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

A MANNED-MACHINE SPACE STATION CONSTRUCTION CONCEPT

Martin M. Mikulas, Jr., Harold G. Bush, Richard E. Wallsom, John T. Dorsey, and Marvin D. Rhodes Feb. 1984 33 p refs

(NASA-TM-85762; NAS 1.15:85762) Avail: NTIS HC A03/MF A01 CSCL 22B

A design concept for the construction of a permanent manned space station is developed and discussed. The main considerations examined in developing the design concept are: (1) the support structure of the station be stiff enough to preclude the need for an elaborate on-orbit system to control structural response, (2) the station support structure and solar power system be compatible with existing technology, and (3) the station be capable of growing in a systematic modular fashion. The concept is developed around the assembly of truss platforms by pressure-suited astronauts operating in extravehicular activity (EVA), assisted by a machine (Assembly and Transport Vehicle, ATV) to position the astronauts at joint locations where they latch truss members in place. The ATV is a mobile platform that is attached to and moves on the station support structure using pegs attached to each truss joint. The operation of the ATV is described and a number of conceptual configurations for potential space stations are developed. Author

N84-19396# European Space Agency, Paris (France).

ENVIRONMENTAL AND THERMAL CONTROL SYSTEMS FOR SPACE VEHICLES

T. D. Guyenne, ed. and J. J. Hunt, ed. Dec. 1983 576 p refs Partly in FRENCH and ENGLISH Proc. of Intern. Symp., Toulouse, 4-7 Oct. 1983; sponsored by CNES and ESA Original contains color illustrations

(ESA-SP-200; ISSN-0379-6566) Avail: NTIS HC A25/MF A01; ESA, Paris FF 250, Member States, AU, CN and NO (+20% others)

Spacecraft thermal testing, thermal control technology, thermal control design, cryogenics, and thermal analysis were discussed. Environmental control systems for space stations and platforms, and in flight experience were considered. For individual titles, see N84-19397 through N84-19462.

N84-19397# European Space Research and Technology Center, Noordwijk (Netherlands).

FUTURE TRENDS IN SPACECRAFT THERMAL CONTROL DESIGNS

E. Slachmuylders and C. Stroom *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 1-7 (For primary document see N84-19396 10-18)

Avail: NTIS HC A25/MF A01

Spacecraft thermal control techniques are reviewed, and it is concluded that present thermal design methods have poor capabilities and very limited growth potential, making it very unlikely that these methods can be extrapolated to larger and more complex spacecraft. It is proposed to change current design techniques and to introduce modular systems structured around a central heat transport bus and temperature controller. Author (ESA)

N84-19398# Aeritalia S.p.A., Torino (Italy).

DEVELOPMENT OF A SPACECRAFT INFRARED TEST TECHNIQUE AS AN ALTERNATIVE TO SOLAR SIMULATION: FIRST STEPS ON L-SAT THERMAL MODEL c15

P. Messidoro, D. Boggiatto, M. Pataccia, and P. Buratti *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 11-17 refs (For primary document see N84-19396 10-18)

Avail: NTIS HC A25/MF A01

The L-Sat satellite was used for an off-line investigation to develop an infrared test technique alternative to solar simulation, because of its large size and the presence of heat pipes on its north/south radiators. The infrared test set-up facility and test sequence; lamp characteristics; surface property measurements; flux calculation; flux measurement; power control system; lamp rig design; and test prediction and correlation are described. Improvements to the test technique are suggested. Author (ESA)

N84-19399# European Space Research and Technology Center, Noordwijk (Netherlands).

SPACECRAFT THERMAL BALANCE TESTING USING INFRARED LAMPS ON A DUMMY SPACECRAFT

G. B. T. Tan and J. B. Walker *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 19-25 refs (For primary document see N84-19396 10-18)

Avail: NTIS HC A25/MF A01

The use of tungsten lamp infrared sources placed in close proximity to a spacecraft undergoing thermal balance testing is discussed. The technique has economic advantages for thermal balance testing of spaceborne objects which are too large to fit into existing conventional solar simulation facilities. It was assessed by using a telecommunication satellite model with typical radiator faces. Comparison of the mathematical model and test model

temperatures is considered acceptable, allowing for the difference between infrared and solar simulation. Author (ESA)

N84-19400# European Space Research and Technology Center, Noordwijk (Netherlands).
IRSIM: A PROGRAM FOR THE CALCULATION OF INFRARED FLUX INTENSITY INCIDENT ON A SPACECRAFT INSIDE A TEST CHAMBER **c75**
R. P. Rogers *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 27-37 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A computer program which calculates the infrared flux intensity received by a specimen in a test chamber is described. Illumination by an array of infrared lamps in thermal testing of spacecraft too large for conventional solar simulators is considered. The code is used to decide on a sensor/baffle/lamp arrangement at an early stage in the test process; and to help resolve discrepancies observed in the test measurements. The modelling of the NOSAT dummy spacecraft is described. Author (ESA)

N84-19401# European Space Agency, Paris (France).
THERMAL CYCLING TESTS IN SPACE ENVIRONMENT SIMULATION CHAMBERS [LES ESSAIS DE CYCLAGES THERMIQUES DANS LES CHAMBRES DE SIMULATION SPATIALE] **c14**
C. Poux (Intespace, Toulouse) *In its* Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 39-42 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Thermal cycling/thermal vacuum test facilities to simulate space environments are described. Solar simulation at 1400 W/sqm is possible. Thermal cycling test temperatures can vary from 100 to 360 K. Thermal vacuum test temperatures between -60 and +55 C are achieved. Infrared tests using 500 W quartz lamps are carried out. The vacuum chambers allow a main satellite spherical body of 3 m diameter, or a deployed configuration of 6 m diameter, 7 m height, to be tested. Author (ESA)

N84-19402*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT AND PLANNED DEVELOPMENTS AT THE GODDARD SPACE FLIGHT CENTER IN THERMAL CONTROL TECHNOLOGY
S. Ollendorf *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 45-51 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Thermal control technology for advanced spacecraft and space stations is presented. Results of proof of concept two phase laboratory devices indicate that large amounts of energy (1 to 2 kw) can be transported long distances (10 to 20 m) with very small temperature differences. An evolutionary test bed for advanced development of thermal technology, which provides data on components and systems for space station designs is described. Results of the STS-3 Thermal Canister Experiment show that the enclosure held simulated instruments to + or - 1 C over a wide range of thermal environments. Author (ESA)

N84-19403# Societe Nationale Industrielle Aerospatiale, Cannes (France).
PRELIMINARY TESTS ON THE U-SHAPED HEAT PIPES OF TV-SAT/TDF-1 [LES ESSAIS ELEMENTAIRES DES CALODUCS EN U DE TV/SAT/TDF-1] **c34**
M. Amidieu *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 53-61 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Ground tests of TV-SAT U-shaped heat pipes using a simplified configuration were carried out to assess performance in the vertical position, in order to prepare more complex models. Results are satisfactory, but flange-vapor heat exchange coefficients vary according to pipe position, and must be determined beforehand in order to calculate thermal gradients accurately. Drying of the flow back branch of the tube can be avoided by a compensating power input. Overheating during start up of the assembly can be eliminated by starting the heat pipes earlier, or by starting the equipments one by one. Author (ESA)

N84-19404# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
DESIGN ASPECTS OF TV-SAT/TDF-1 HEAT PIPES **c34**
R. Meyer and U. Laux *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 63-66 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The TV-SAT/TDF-1 applied constant conductance heat pipes are described. They consist of axially grooved aluminum profiles with ammonia as working fluid. Main design criteria were the heat transport capability; high inactive length associated with the amounts of ammonia fluid inventory; low mass; and standardization of profile sizes. The iterative process used in profile design is outlined. A SPAS 01 performance test of the heat pipe is mentioned. Author (ESA)

N84-19405# Aeritalia S.p.A., Torino (Italy). Space Sector.
HEAT PIPES FOR THE L-SAT COMMUNICATIONS MODULE RADIATORS **c34**
M. Papaccia, V. Perotto, B. Sessions, and H. Kreeb (Dornier-Werke G.m.b.H., Friedrichshafen, West Germany) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 67-74 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Constant conductance aluminum axial groove ammonia heat pipes for L-SAT 1 north/south radiators were developed. Twenty-four pipes on the south radiator and 38 on the north reject directly imposed heat loads of 600 W and 700 W, respectively. Pipe inner diameter is 5.0 mm, outer square dimension = 9.0 mm. Integral fins provide equipment mounting support and increased thermal efficiency. Pipe lengths range from 0.72 m to 1.238 m. The L-SAT honeycomb radiators offer up to 5.23 sqm radiating area each (2.1 x 2.58 m less the solar array drive mechanism). To establish the manufacturing techniques for the heat pipe radiators and to acquire confidence in the analytical modeling approach, a development model heat pipe radiator measuring 0.8 m x 1.6 m with ten 1.5 m long heat pipes was tested in a vacuum chamber. Author (ESA)

N84-19406# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
A VARIABLE CONDUCTANCE HEAT PIPE (VCHP) RADIATOR SYSTEM FOR COMMUNICATIONS PAYLOADS **c34**
N. H. Pennings and C. J. Savage (ESTEC, Noorwidjk, Netherlands) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 75-81 Sponsored by ESTEC (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A thermal control system to support the development of a multibeam antenna array system for communication satellites is discussed. Trade-off shows that for the antenna power amplifiers a system using variable conductance heat pipes (VCHPs) is the optimum heat rejection system. The VCHP-concept is compared with louvers, phase change materials, feedback controlled heat pipes, and heaters. With passively controlled reservoirs and subject to a factor of 3 variation in the power dissipation, the VCHP concept features a temperature range of 10 to 50 C. The system is suitable for all spacecraft with remote dissipating and radiating elements. Author (ESA)

N84-19407# Centre National d'Etudes Spatiales, Toulouse (France).
OUTLINE AND EVALUATION OF A SPACEBORNE SODIUM HEAT PIPE FURNACE WITH THREE COMPARTMENTS [ELABORATION ET EVALUATION DES PERFORMANCES D'UN FOUR SPATIAL CALODUC A SODIUM A 3 ALVEOLES] **c34**
G. Bellaiche, B. Duc (CEA, Grenoble, France), J. Chaudourne (CEA, Grenoble, France), J. J. Favier (CEA, Grenoble, France), and P.

Contamin (CEA, Grenoble, France) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 83-90 refs In FRENCH; ENGLISH summary (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A materials science sodium heat pipe furnace, consisting of three 11 mm dia tubes set in a 50 mm dia, 120 mm long cylinder, for microgravity experiments, was developed. Heat exchange takes place between the tubes and the inner wall of the cylinder, ensuring very small temperature gradients. Operating temperatures range from 550 to 1000 C, generating condensation and evaporation heat transfer coefficients of the order of 10 to 100 kW/deg C/sqm. This flux is transported almost isothermally, and automatically, by a capillary system. Tests show that longitudinal inhomogeneity of the system is < 1C, gravitational influence < 2C. Author (ESA)

N84-19408# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
THERMAL CONTROL DESIGN OF ISPM c15
H. Petersen *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 95-102 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

International Solar Polar Mission (ISPM) objectives, spacecraft configuration and thermal design requirements are described. Elements of the ISPM power supply subsystem which are essential features of the thermal design are discussed. A hydrazine heating system with Dale resistors is assessed. Test results regarding blanket improvements and Kapton thermal control coatings are presented. Differences between ISPM launch by the STS compared with a conventional rocket launch are highlighted. Author (ESA)

N84-19409# Societe Nationale Industrielle Aerospatiale, Cannes (France).
THERMAL CONTROL OF THE EXOSAT EUROPEAN SATELLITE [LE SATELLITE EUROPEEN EXOSAT: SON CONTROLE THERMIQUE] c15
A. Lanteri *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 103-111 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The EXOSAT thermal control concept and ground testing are described. The satellite temperature control techniques include black and white paint, aluminized teflon, gold coatings, alodine, multilayer thermal insulation blankets, conductive radiators, and heaters. Ground tests were based on thermal vacuum tests with solar simulation. Several months in orbit reveal no problems.
Author (ESA)

N84-19410# Saab-Space A.B., Linkoeping (Sweden).
VIKING SATELLITE THERMAL CONTROL ANALYTICAL VERIFICATION AND TEST c15
B. Moertberg and P. Svensson *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 113-117 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Thermal control of the Viking satellite, which investigates interaction between hot and cold plasma in the magnetosphere, is described. The satellite has one cold side always turned away from the Sun and three louvers on units with varying dissipation, e.g., the transponder. Thermal trimming is done by adjustment of trim areas on the satellite and by changing louver set points. All multilayer insulation outer layers have the aluminized side out, and they are grounded for electromagnetic compatibility. The thermal design is validated by analysis and system thermal balance tests. Author (ESA)

N84-19411# Centre National d'Etudes Spatiales, Toulouse (France).
THERMAL CONTROL OF THE SPOT PLATFORM [LE CONTROLE THERMIQUE DE LA PLATE-FORME] c15
I. Alet and J. L. Foret (SNIAS, Cannes, France) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 119-125 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The SPOT active and passive thermal control systems are described. Multilayer insulation, paint, second surface mirrors, Kapton solar absorbers, and aluminized coatings are supplemented by heaters, particularly for propulsion system thermal control. Thermal vacuum tests on scale and flight models confirm thermal design. Author (ESA)

N84-19412# European Space Research and Technology Center, Noordwijk (Netherlands).
THERMAL DESIGN OF THE GIOTTO SPACECRAFT c15
F. Felici and P. Lindhout (Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 127-137 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The thermal design adopted for the Giotto spacecraft to overcome the problems of varying solar flux, a large range of solar aspect angles, and differing internal power dissipation is described. Thermal control is based on an internal enclosure housing all equipment and payloads, isolated from space and from the kick motor. Dust shields are decoupled radiatively and conductively from the spacecraft main body. The main radiator is an annular honeycomb panel under the high gain antenna at the top of the spacecraft. Skirt radiators are distributed around the outer panels between the main and the experiment platform. Inside the enclosure, the highly dissipating TWT's and reaction control equipment are isolated. Author (ESA)

N84-19413# MATRA Service Aerodynamique, Toulouse (France).
THERMAL CONTROL OF TELECOM 1 [LE CONTROLE THERMIQUE DE TELECOM 1] c15
J.-F. Arnoult, M. Koedinger (SNIAS, Cannes, France), and A.-M. Pouzet (CNES, Toulouse) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 139-148 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Thermal control of the Telecom 1 satellite during the transfer phase (100 W dissipated) and during the three axis stabilized operational phase (450 to 635 W for the payload, 190 for the service modules) is outlined. Thermal control is based on passive techniques (solar reflectors, paints, multilayer insulation) with each satellite subsystem independently thermally controlled. A modular approach is also applied to the main body of the satellite.
Author (ESA)

N84-19414# Aeritalia S.p.A., Torino (Italy).
THE THERMAL DESIGN OF L-SAT LARGE TELECOMMUNICATION SATELLITE c15
D. Boggiatto, E. Colizzi, R. Veneri, and E. Sacchi *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 149-159 refs Sponsored by ESA and British Aerospace Dynamics Group (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The passive thermal control design of the L-SAT series of satellites is outlined. Multilayer insulation blankets, heaters, thermal doublers, paints, and thermal fillers/stand offs are supplemented by constant conductance heat pipes, electrically conductive coated second surface mirrors, and a multilayer insulation outer layer. The heat rejection philosophy is standard for a three axis stabilized geostationary satellite, with external appendages insulated from the spacecraft body. Author (ESA)

N84-19415# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
THERMAL DESIGN AND PERFORMANCE OF THE IRAS SPACECRAFT SYSTEM c15
P. L. vanLeeuwen *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 163-170 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Thermal design and testing of the spacecraft part of the Infrared Astronomy Satellite are summarized. The interface of the housekeeping spacecraft and the cryogenically cooled telescope is described. Thermal control is based on passive techniques, except for the battery and gyro sensor which have heaters. Flight temperature measurements show excellent agreement with predictions, but also reveal a steady increase in spacecraft temperatures. This is attributed to degradation of the silver teflon control surface. Author (ESA)

N84-19416# Ball Aerospace Systems Div., Boulder, Colo.
ONE YEAR OF STARS, PROVIDED BY THE IRAS CRYOGENIC SYSTEM **c19**
A. R. Urbach, R. A. Hopkins, and P. V. Mason (JPL, Pasadena, Calif.) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 171-177 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The IRAS telescope design and flight performance are described. The telescope is an f/9.6, 57 cm aperture Ritchey-Chretien, surrounded by a 545l tank containing superfluid helium maintained at 1.7 K by venting to space through a fixed flow impedance. The primary and secondary mirrors and the structure are of beryllium, to minimize thermal deformations and reduce cooldown times while providing satisfactory IR performance. The cryogenic structure is enclosed by a vacuum shell. A sunshade minimizes heat input. In orbit, the telescope optics are maintained at < 4.5 K, detectors at < 2.7 K, and the cryogen loss rate indicates a lifetime > 11.5 months. The IRAS detected a 100 AV diameter cloud of cold matter around Vega, a 20 million miles long dust trail following Temple 2 comet, and discovered 4 comets.Author (ESA)

N84-19417# European Space Research and Technology Center, Noordwijk (Netherlands).
THERMAL DESIGN OF INFRARED SPACE OBSERVATORY (ISO) PAYLOAD DUAL COOLING **c19**
F. Franco and M. Sander (MBB, Ottobrunn, West Germany) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 179-190 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The thermal design and performance of a spaceborne IR telescope are outlined. The dual cooling system uses superfluid helium (1.5 K) to provide the required temperatures for semiconductor devices, mirrors, and telescope baffle. Liquid hydrogen (20 K) absorbs external heat and provides a suitable environment for the helium system. Two 750l tanks contain the coolants. The fluid management system, thermal layout, and thermal analysis are described. Computer simulations indicate that the detector and optics designs are compatible with an operational lifetime > 18 months. Author (ESA)

N84-19418# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
DESIGN AND TEST OF A CRYOGENIC PHASE SEPARATOR FOR ZERO-G ENVIRONMENT **c19**
M. Mueller, A. Seidel, and J. Lizon-Tati (ESTEC, Noordwijk, Netherlands) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 191-196 (For primary document see N84-19396 10-18)
(Contracts ESA-4596/81/NL-AK(SC); ESA-5325/83/NL-PB(SC))
Avail: NTIS HC A25/MF A01

The design and testing of a constant pressure heat exchanger phase separator system for the stabilization of the temperature or pressure within a tank containing a cryogenic liquid (other than superfluid helium) in a zero g environment, where this liquid is the cold source in an open loop system, are described. The system features two tank-attached heat exchangers with an inlet and an outlet valve. Saturated or slightly overheated vapor is supplied at the exit of at least the second heat exchanger. The system is independent of the phase state of the cryogen at the tank exit valve under zero g conditions. Tests using liquid hydrogen as the working fluid are satisfactory for a wide range of simulated heat loads and different cryogen phase states. Author (ESA)

N84-19419# MATRA Service Aerodynamique, Toulouse (France). Space Instrumentation Div.
ACTIVE THERMAL CONTROL OF THE FAINT OBJECT CAMERA **c19**
G. Soulat *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 197-205 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The thermal analysis of the Space Telescope faint object camera up to the thermal design of the optical bench enclosure (OBE) is described. Thermal control law elaboration and the determination of the relevant gains are discussed. The OBE is to be maintained at 17 + or - 2 C during operating modes and between -10 and +35 C during nonoperating modes. During any 10hr period of the 5yr design life in which an exposure is made, average temperature variation of the optical bench is < 0.25 C. The thermal environment is assured by maintaining dedicated load carrying structure areas at a nearly constant, actively regulated, temperature. Each thermally controlled area is equipped with a thermistor (and heaters) whose output signal is digitized, then processed by the onboard computer which controls the heaters. Author (ESA)

N84-19420# European Space Research and Technology Center, Noordwijk (Netherlands).
SUPERFLUID HELIUM CRYOSTAT FOR SPACE UTILIZATION (CRHESUS): DEVELOPMENT AND TEST OVERVIEW [CRYOSTAT A HELIUM SUPERFLUIDE POUR UTILISATION SPATIALE CHRESUS: BILAN DU DEVELOPMENT ET DES ESSAIS] **c19**
J. Lizon-Tati, D. Imbert (SNIAS, Cannes, France), and M. Till (Air Liquide, Sassenage, France) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 207-216 refs In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The characteristics of a flight prototype liquid helium cryostat for spaceborne applications are summarized. Waiting time on the ground without outside intervention is 7 days at a temperature < 2.17 K. Orbit life is 24.5 days at a temperature < 1.7 K. Technology experiments weighing up to 15 Kg can be accommodated. Valves, thermal insulation, liquid-vapor phase separator, cryogenic fluid management system, and safety devices are described. Author (ESA)

N84-19421# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
A THERMAL ANALYIS APPROACH APPLIED IN EARLY STAGES OF A PROGRAM
G. W. Dierssen *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 219-222 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A thermal analysis approach capable of implementing layout changes as they occur during a satellite definition phase, without important cost and time penalties, is described. A model layout is created by lumping equipment properties (e.g., heat dissipation) into the supporting equipment platform. The equipment no longer affects the geometry, and this geometry is used to calculate radiation exchange factors. Layout changes are implemented by changing platform parameters. A method of assessing uncertainties due to lumped node temperature deviation from unit temperature is presented. Application to the Hipparcos satellite design definition phase is outlined. Author (ESA)

N84-19422# Indian Space Research Organization, Bangalore. Satellite Center.
THERMAL NETWORK CORRECTION BY SIMPLEX OPTIMIZATION **c34**
K. Badari Narayana, D. R. Bhandari, and H. N. Murthy *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 223-229 refs (For primary document see N84-19396

10-18)
Avail: NTIS HC A25/MF A01

Thermal parameter correction using simplex optimization is illustrated using the RS-D2 satellite model. The method consists of a regular geometric figure of dimension "N", where "N" is the number of parameters to be determined. The objective function is determined at the vertices of this figure. The point with maximum value of objective function is discarded and search for a new vertex is made, in the direction of the line joining the discarded vertex and centroid of the figure formed by the remaining points. A point is selected on the other side of the centroid at a distance equal to that between discarded point and the centroid. Depending upon the value of the objective function at this new point, the new vertex is selected by reflection, contraction, expansion, or reduction. Vertex rejection continues till the function value is reduced below an acceptable value. Most parameters are corrected to within 2%. Author (ESA)

N84-19423# Institute of Space and Astronautical Science, Tokyo (Japan).
THERMOFLUIDYNAMICS OF HEAT PIPES c34
Koichi Oshima and Masahide Murakami (Tsukuba University, Japan) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 231-234 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The operation of high heat flux heat pipes is analyzed using a thermodynamic phase diagram, and the gasdynamic heat pipe which uses the gasdynamic effect of the vapor flow for pumping up the liquid onto the evaporator is discussed. A space station thermal control system using the gasdynamic heat pipe is introduced. This system does not need any external force and is self-controlled. It ensures high system reliability as well as wide design flexibility. Author (ESA)

N84-19424# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
UNIAXIAL MODEL FOR GAS-LOADED VARIABLE CONDUCTANCE HEAT PIPE PERFORMANCE: THE EFFECTS OF VAPOR FLOW, FRICTION, AND INERTIA c34
A. A. M. Delil and H. A. M. Daniels *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 235-241 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A steady state uniaxial model for the transient performance of gas loaded variable conductance heat pipes, that accounts for diffusion at the vapor-gas interface, inertia and friction of the moving vapor, and radial conduction in the wall and wick is described. Calculations show that diffusion is negligible; inertial effects are considerable in the operating range characterized by low vapor pressure (this is a wide range for working fluids like methanol and liquid metals) and that friction, causing velocity increase of subsonic flow, enhances the impact of inertia and widens the operating range. Performance and controllability figures that considerably differ from those predicted by models which neglect inertia and friction are obtained. Author (ESA)

N84-19425# European Space Research and Technology Center, Noordwijk (Netherlands).
MANIP AND MINIP, NEW MODELING TOOLS FOR THE THERMAL ENGINEER c34
A. M. Davidson and C. Stroom *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 243-248 Original contains color illustrations (For primary document see N84-19396 10-18)
Avail: NTIS HC A21/MF A01

The MANIP fully interactive system for spacecraft thermal model creation, maintenance, simulation definition and results analysis, with a limited capability for interactive simulations execution is introduced. The MINIP is a fully interactive, user-adapted front-end processor for existing calculation and analysis programs, used to demonstrate and prove MANIP ideas. The MINIP uses high speed color graphics displays to prompt the user for the definitions of surfaces; to verify the geometry; to produce high quality semirealistic displays of the model; and to access model data via a graphical editor. The system is completely menu driven, and requires no knowledge of the computer on the part of the user. Author (ESA)

N84-19426# European Space Research and Technology Center, Noordwijk (Netherlands).
ESATAN: A THERMAL NETWORK ANALYSIS COMPUTER PROGRAM c61
W. Lebrun, J. N. Loughhead (GEC, Whetstone, England), G. A. Miles, C. Stroom, and J. R. Turner (GEC, Whetstone, England) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 249-257 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The ESATAN computer program for lumped parameter spacecraft thermal analysis, written in FORTRAN 77 is described. Models are defined and handled as hierarchical structures of component submodels. Large models can be easily assembled from existing submodels without, e.g., procedures to ensure uniqueness of node numbers. The editor enables models to be modified easily with immediate detection of any resultant logical inconsistencies. Models are stored in a data base which has an associated referencing listing explicitly defining its contents. The MORTRAN language through which the user can dynamically perform complex operations on his model during solution is provided. A comprehensive library is provided to perform many of the operations required to effect solutions to the model. Author (ESA)

N84-19427# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
THE SPACELAB ATMOSPHERE STORAGE AND CONTROL SECTION (ASCS) AND ITS ORBITER COMMON HARDWARE FLIGHT PERFORMANCE
P. Lautenbach, D. Vossloh, G. R. Ord (Moog, Inc., East Aurora, N.Y.), and J. J. Walleshauser (Moog, Inc., East Aurora, N.Y.) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 261-269 (For primary document see N84-19396 10-18)
(Contract ERNO-CC-DS-000-100)
Avail: NTIS HC A25/MF A01

Functions and hardware common to the Spacelab atmosphere storage and control section and orbiter atmospheric revitalization pressure control subsystem are described. Design changes to the oxygen partial pressure sensors, oxygen and nitrogen flow sensors; cabin pressure regulator; pressure balanced latching valve controlling oxygen and nitrogen flow; and cabin positive pressure relief valve are indicated. Orbiter/Spacelab atmosphere interactions are discussed. Two anomalous high flow conditions during Orbiter flights are mentioned. Author (ESA)

N84-19428# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
SPACELAB/ORBITER ATMOSPHERE REVITALIZATION SUBSYSTEM COMMONALITY AND FLIGHT EXPERIENCE c54
P. Lautenbach, R. Vaeth, and J. E. Swider (Hamilton Standard, Windsor Locks, Conn.) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 271-279 (For primary document see N84-19396 10-18)
(Contract ERNO-CC-DS-000-100)
Avail: NTIS HC A25/MF A01

The Spacelab/orbiter atmosphere revitalization subsystem cabin and avionics air loops are described, and performance during STS flights is described. The cabin loop contains a fan, a CO2 control assembly, humidity and temperature controls, a water separator, condensate storage, an overboard dumping assembly, and an air distribution assembly. The avionics loop includes fans, heat exchangers, smoke sensors, a rack cooling assembly, and fire suppression system. Differences between orbiter and Spacelab requirements are indicated. Author (ESA)

N84-19429# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
THE COMPLEMENTARY ROLES OF EXISTING AND ADVANCED ENVIRONMENTAL, THERMAL CONTROL AND LIFE SUPPORT TECHNOLOGY FOR SPACE STATIONS c54
A. I. Skoog and H. F. Brose (Hamilton Standard, Windsor Locks, Conn.) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 281-288 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The role of existing technology, especially Shuttle and Spacelab equipment, and the evolution to incorporation of advanced hardware in a closed loop environmental thermal control and life support (ETCLS) system are discussed. Analyses of regenerative and closed loop systems performed during Space Operations Center, Manned Space Platform, Space Station and Spacelab programs are reviewed. Cabin atmosphere, hygiene, water management, and galley requirements are considered. It is concluded that a considerable amount of existing ETCLS equipment can be used for space stations. Author (ESA)

N84-19430# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
BIOLOGICAL LIFE SUPPORT SYSTEM c51
H. P. Leiseifer, A. I. Skoog, and A. O. Brouillet (Hamilton Standard, Windsor Locks, Conn.) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 289-298 refs Previously announced in IAA as A84-11755 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The feasibility and requirements of biological life support systems (BLSS) for permanently manned large space stations were analyzed. Functional requirements include atmosphere maintenance, and waste water reclamation. The BLSS components are humans, animals, plants and microorganisms integrated with other supporting physicochemical components. With regenerable physicochemical subsystems in the life support system, the water and oxygen loops can be closed. The benefits in weight, volume and resupply cost are generally achieved by mission durations on the order of 30 to 60 days for a 4 to 8 man crew. The carbon loop can be closed if metabolic waste products are regenerated and food is produced. Author (ESA)

N84-19431# Ecole Nationale Superieure de Mechanique et d'Aerotechnique, Poitiers (France).
INTEGRATION OF MATHEMATICAL MODELS: EXPERIENCE OF FIRST SPACELAB MISSION
A. Alexandre, J. B. Saulnier, H. P. Schmidt (DFVLR, Porzwahn, West Germany), and J. P. Bouchez (ESTEC, Noordwijk, Netherlands) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 299-306 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Integration of a condensing heat exchanger (CHX) model and a thermal model of the material science double rack (MSDR) into comprehensive models of Spacelab is described. Transfer variables (nodal potential representing temperatures masses, or fluxes) were chosen to ensure the best information flow between subsystem and comprehensive models. Direct incorporation of the CHX was compatible with the Spacelab model. For MSDR an iterative process with a 250 node Spacelab model and 100 node rack model was adopted. Results suggest that both methods are valuable in clarifying interface data and in reducing computer run time. Author (ESA)

N84-19432# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
SYSTEM ASPECTS OF THE EUROPEAN RETRIEVABLE CARRIER (EURECA) THERMAL CONTROL SYSTEM
U. Laux and J. Weydandt *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 307-315 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The impacts of EURECA overall system requirements such as microgravity level, comparatively high power, and the reusability aspects on the thermal control concept design are discussed. Investigations of orbiter cargo bay parking phase show that under worst case conditions the temperatures of batteries and the subsystem equipment cannot be kept in the required temperature range without provision of heater power. Active thermal control system impacts on the micro-g environment have to be suppressed by secondary measures. The long duration of the operational phase entails design changes of the existing freon pump package. Mass flow and temperature variation/drift requirements of directly cooled instruments should be assessed in order to avoid an unnecessary complexity of the thermal control system. For payload instruments which need cold plate contact a thermal diffuser panel is proposed to simplify the accommodation of those instruments and to reduce the number of cold plates. Author (ESA)

N84-19433# Politecnico di Torino (Italy).
ADAPTIVE CONTROL OF THERMAL FLUID LOOPS FOR SPACE APPLICATIONS c63
V. Marchis and N. Nervegna *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 319-327 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Microprocessor based adaptive digital control of spacecraft thermal fluid loops is reviewed. Skylab and Spacelab active control systems are described and basic concepts in adaptive control are recalled. The penalized control method is outlined for control of experiment temperatures thermally dependent on the heat removal action of a cold plate serially linked to a pumped fluid loop featuring a radiator system. Author (ESA)

N84-19434# Aeritalia S.p.A., Torino (Italy). System Engineering-Space Sector.
DESIGN AND MANUFACTURING OF A HEAT REJECTION SYSTEM FOR ADVANCED THERMAL CONTROL
L. Bussolino and J.-P. Bouchez (ESTEC, Noordwijk, Netherlands) *In* ESA Environ. and Thermal Control System for Space Vehicles Dec. 1983 p 329-335 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A Technology Demonstration Model (TDM) of a heat rejection system dedicated to advanced spacecraft and payload thermal control was manufactured. The TDM consists of radiator panels (1.2 x 1.85 m), Spacelab type piping, fluid loop servicer with pump package, thermal control valves (bypass and flow metering) and a microprocessor based electronic control unit. Studies leading to the definition of the TDM; the design and manufacturing activities of the components; and the test program are described.
Author (ESA)

N84-19435# European Space Research and Technology Center, Noordwijk (Netherlands).
THE GIOTTO THERMAL CONTROL SHUTTER
F. Felici and G.F. Brouwer (Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost) *In* ESA Environ. and Thermal Control Syustems for Space Vehicles Dec. 1983 p 337-344 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The shutters which control radiators on curved body panels (skirt) of the Giotto spacecraft are described. The shutter consists of a mechanism, driven by a stepper motor, which rolls in and out a goldized Kapton foil in front of a spacecraft radiator. The electronic control circuits and the power supply of the motor and the status monitoring logic are all housed in a common remote electronic unit, which controls the shutters. These devices are operated under ground control without automatic reference to local radiator temperatures. Shutter total area is 860 sqcm with a useful radiating area of 600 sqcm. Weight of the mechanism (without electronics) is 1 Kg. Data concerning mechanical and thermal testing of the device, at unit and at system level are reported. Author (ESA)

N84-19436# MRJ, Inc., Fairfax, Va.
MOTORIZED THERMAL CONTROL SHADE
Han Hwangbo *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 345-349 ref (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The Motorized Thermal Control Shade (MTCS) for control of the radiant energy emitted and the solar energy absorbed by the radiator of a spacecraft is described. The MTCS is made of a roll of thin film with various cutout patterns and two drive rollers. One end of the shade is wound around the roller, which is loaded by a self-winding spring. The other end is attached to the drive roller. The MTCS are placed over the second surface mirror radiator. The shade can be wound either forward or backward by the drive motor and set to any desirable open/close position of the radiator. The temperature of the equipment mounted on the radiator is maintained within the specified limits by controlling the net effective radiating area using MTCS. The MTCS also serves as a cover to protect radiator surfaces from contamination by rocket exhausts and other sources of gas. Author (ESA)

N84-19437# Toshiba Research and Development Center, Kawasaki (Japan).
DEVELOPMENT OF A THERMAL CONTROLLER FOR SPACE APPLICATION
Y. Miyazaki and T. Sasaki *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 351-356 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A thermal switch type thermal controller for space application, its engineering model test and results are described. The thermal switch consists of a bellows vessel charged with working fluid and a space radiator. It has 200 x 200 mm radiator area and 30 mm thickness. Weight is 500g. Tests were performed for Freon R12 and Freon R114 working fluid. Effective emissivity variation achieved is 0.05 to 0.45 per 10K and 0.05 to 0.55 per 20K for Freon R12. Author (ESA)

N84-19438# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
A NEW TRAVELING WAVE TUBE (TWT) COOLING CONCEPT c33
M. Haimerl and H. Kreeb *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 359-364 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The feasibility of a completely conductance cooled TWT for highly dissipating (> 600 W) radar on ERS-1 (ESA) was analyzed using a thermal mathematical model and by testing. Tests show that the tube can be activated and tested without problem; no failure (burn-out) of a heat pipe occurs; the baseplate is isothermal (radiator segment within 2 C); and there is no measurable temperature drop through the heatpipe panel. The temperature drop between the tube baseplate and the radiator surface is 20C for heat dissipation of 270W; 40C for 640W. The temperature of the heat pipes is a couple of degrees above the radiation temperature. The test with 6 active heatpipes only shows an increase of the interface temperature drop of 50%. Author (ESA)

N84-19439# Centre National d'Etudes Spatiales, Toulouse (France).
SUN FOCUSING BY SATELLITE ANTENNA REFLECTORS [FOCALISATION DU SOLEIL PAR LES REFLECTEURS D'ANTENNE] c44
I. Alet *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 365-370 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Solar flux reflected into the focal plane of direct television satellite antennas was estimated using a 2 sqm antenna model. Results show that the antenna reflects 0.15 solar constant flux into its focal plane. Measurement imprecision due to environment inhomogeneity is estimated at 0.05 solar constant. The flux is diffuse and very homogenous in a 50cm diameter zone around the focal point. There is no specular reflection, and the flux is proportional to the geometrical view factor towards the reflector. The flux is not dangerous for the thermal control of the antenna cone of direct TV satellites, since it only occurs during cold periods, particularly when entering or leaving eclipse. Author (ESA)

N84-19440# Societe Nationale Industrielle Aerospatiale, Cannes (France).
THERMAL CONTROL OF MULTIMISSION BATTERY COMPARTMENT OF SPOT [CONTROLE THERMIQUE DU COMPARTIMENT BATTERIES SPOT MULTIMISSION] c34
H. Fagnoni *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 371-379 refs In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The design, manufacture, and testing of the SPOT satellite battery compartment are described. The compartment, situated at the bottom of the central tube of the platform, consists of a central support structure which also acts as a radiator, the batteries, and associated thermal controls. It can hold 2 to 4 SAFT VO245 batteries. It adapts to mission requirements by modifying the multilayer insulation and by adjusting heating power. Author (ESA)

N84-19441# Centre National d'Etudes Spatiales, Toulouse (France).
THERMAL CONTROL OF THE SPOT HRV INSTRUMENT [CONTROLE THERMIQUE DE L'INSTRUMENT HRV] c19
J. Mauduyt, G. Bonnet (Matra Service Aerodynamique, Toulouse), and Y. Toulemont (Matra Service Aerodynamique, Toulouse) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 381-389 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Temperature control of the SPOT pushbroom multispectral camera (HRV instrument) is discussed. During operation electronic equipment must be kept between -10 and + 50C, except for imaging system modules, which must be kept between 20 and 45C. The CCDs must be maintained at 20C + or - 2C. Permissible optical axis deformation due to thermoelastic effects is 0.0002 rds. A passive control system, with fine adjustment by active control, is adopted. Ajustability on the ground of radiative surfaces enables heating power to be limited to half of the power budget, guaranteeing the efficiency of temperature regulation by modification of thermistor thresholds. Author (ESA)

N84-19442# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
THERMAL DESIGN OPTIMIZATION FOR SPACECRAFT DURING TRANSFER ORBIT
D. Chalmers *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 391-398 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The state of the art of satellite temperature control design, and thermal performance in transfer orbit preceeding injection into geostationary orbit (GEO) of ESA satellites are discussed. Since GTO can last from 1 to 12 days, and present missions of 7 to 10 yr in GTO are planned, the minimum amount of extra equipment or design impact should be devoted to the GTO stage. The optimum design solution for GTO is to configure the satellite as near as possible to geostationary orbit (GEO) configuration. For temperature control systems (TCS) advantages include reduced risk, less testing, simplified circuitry, and possible mass savings due to the reduced amount of hardware equipment required only for GTO. It is envisaged that in future 3-axis stabilised GEO satellites, the recommendation from the TCS will be to configure the satellite as near to the GEO configuration as possible, i.e., deploying solar arrays to enable heater power to provide the necessary satellite temperature level. Author (ESA)

N84-19443# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Thermal Control Section.
THERMAL DESIGN FEATURES OF ROSAT X-RAY TELESCOPE **c19**
R. E. Benz, U. G. Hingst, and W. J. Schwarzott *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 399-406 Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Thermal design of the ROSAT 80 cm Wolter telescope is discussed, and computer aided design techniques used in thermal analysis are described. The high resolution requirements necessitates a special temperature stabilization system in order to avoid unceptable thermal distortions. In order to provide minimum temperature gradients and minimum temperature fluctuations, a thermal baffle, a heating system for mirror and optical bench, and an insulation system were designed. Radiative heat exchange within the specular reflecting mirror system and the propagation of heat flux within the thermal baffle are considered. Specular reflectance of the baffle lamellas increases heat losses. Thus for the baffle system a diffuse low emittance coating on the lamella surfaces is advocated. Author (ESA)

N84-19444# Aeritalia S.p.A., Torino (Italy). Space Sector.
THERMAL CONTROL OF TETHERED SATELLITE IN A VERY LOW ALTITUDE AERODYNAMIC MISSION **c15**
G. Borriello, C. Chiarelli, G. Pellis, and F. Al-Astrabadi *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 407-416 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Aerodynamic heating rates that a very low altitude satellite (100 km) can experience were calculated. A theoretical analysis, evaluating Knudsen number for flow regimes from free molecular to transition, is presented. Although it is not possible to predict with high confidence level the heating rates in transition flow regimes, the analysis data can be used to facilitate theoretical development. Metallic and ceramic thermal shields to protect the satellite primary structure were investigated. Conventional design methods are proposed to control internal unit temperature. Author (ESA)

N84-19445# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
EIGHT YEARS OF IN ORBIT EXPERIENCE WITH THE HELIOS SOLAR PROBE THERMAL CONTROL SUBSYSTEM **c12**
K. Beckmann *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 419-424 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

In obrit experience with HELIOS A and B thermal control coatings, louvers, and heating systems is summarized. Data indicate that the thermal control subsystem performs well under solar irradiation varying between 1 and 11,9 SC. This facilitated the operation of the probe far beyond the original specified lifetime of 1,5 years. The orbit data from 8yr show that the solar array fin system, louver, heater, insulation, and coatings, react as expected. The long term degradation of thermal control coatings shows expected behavior for standard (SSM); conductive coating SSM and aluminized Teflon accelerate in their degradation behavior after a certain point. For aluminized Teflon foil, this reduces mechanical strength, which presumably led to destruction of an experiment Sun shield after 5yr in orbit. Author (ESA)

N84-19446# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
OTS 2: FIVE YEARS OF THERMAL TESTING ON A SATELLITE IN A GEOSTATIONARY ORBIT **c15**
D. R. Chalmers, H. G. Konzok, J. P. Bouchez (ESTEC, Noordwijk, Netherlands), and D. Howle (ESTEC, Noordwijk, Netherlands) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 425-436 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

In flight degradation rates of OTS-2 optical solar of reflectors (OSR), multilayer insulation (MLI) and paint thermo-optical material properties were determined. Equinox data show a significant increase in temperature with time. This increase is nearing stabilization, and is related to degradation of the coatings on the surfaces rotating daily with respect to the Sun vector (white paint on antenna dishes, outer Kapton layer of MLI, and the spacecraft adapter and other appendages such as thrusters, IR sensors). For successive pairs of solstice seasons, the increases in temperature are larger than expected, and are a result of an increase in absorptance of the OSRs, but the exact reason is not yet known. It is most likely that it is caused by contamination at the beginning of the mission. Author (ESA)

N84-19447# Institute of Space and Astronautical Science, Tokyo (Japan).
MEASUREMENT OF ALPHA/EPSILON RATIO BY USING A SUN POINTING SATELLITE TANSEI 4
A. Ohnishi and T. Hayashi *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 437-440 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The ratio of solar absorptance to thermal emittance for several spacecraft materials was measured using a technological test satellite Tansei 4, pointing at the Sun in a 500 km altitude orbit. The ratio for black paint increases rapidly for the initial phase (56 days after launch), and shows slow decrease thereafter. The ratios for aluminized Teflon, aluminized Kapton, and two kinds of solar cells slowly increase for 600 days after launch and become constant. In 3yr of orbital flight (18,000 equivalent solar hours) ratios increase 17% for aluminized Teflon, 22% for aluminized Kapton, 3% for black paint, 6% solar cells. Author (ESA)

N84-19448# Mitsubishi Electric Mfg. Co. Ltd., Amagasaki (Japan).
DEGRADATION OF THERMAL SHIELD MATERIALS IN THE SPACE RADIATION ENVIRONMENT **c15**
S. Shimoji, H. Kimura, M. Koitabashi, T. Imamura, R. Kasai, and M. Matsushita (National Space Development Agency, Japan) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 441-446 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Changes in temperature distribution data of Experimental Technology Satellite 4 after its 3 months mission term are discussed. Analysis of the data suggested that the thermal shields loose their function in the space radiation environment. The effect of energetic particles on the shield materials was investigated. Electron beams of 500 keV and proton beams of 900 keV were irradiated on silver-Teflon and aluminized Kapton films. The fluences were changed between 10 to the 14th and 10 to the 16th power sqcm. Temperature varied between -100 and 100C. Solar absorptance, infrared emittance, tensile strength and elongation rate were measured. Thermogravimetry, infrared spectroscopy and X-ray diffraction were performed. Electron fluxes have remarkable effects on the mechanical properties, proton fluxes on the thermophysical properties of silver-Teflon film. Kapton films do not change much. Author (ESA)

N84-19449# Lockheed Missiles and Space Co., Palo Alto, Calif.
EFFECTS OF COMBINED ULTRAVIOLET AND OXYGEN PLASMA ENVIRONMENT ON SPACECRAFT THERMAL CONTROL MATERIALS
M. McCargo, R. E. Dammann, J. C. Robinson, and R. J. Milligan *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 447-454 refs Sponsored by Lockheed Palo Alto Research Laboratory Directorate (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A laboratory plasma reactor was built to study the effects on surface properties of materials flown in space shuttle cargo bays of the interaction of the surfaces with atomic oxygen in low Earth orbit. The apparatus, the effects of oxygen plasma plus ultraviolet

radiation on thermal control materials, changes in optical properties, and rate of weight loss are described. Results show that UV effects are negligible in all cases, and that changes are due to the oxygen environment. Author (ESA)

N84-19450# European Space Agency, Paris (France).
THERMAL TEST DATA ANALYSIS [METHODES DE DEPOUILLEMENT DES ESSAIS THERMIQUES] c15
S. Michel (Intespace, Toulouse) *In its* Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 457-459 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A data acquisition and processing system for temperature measurements in a space environment simulation facility is described. The system handles 320 low level thermocouple signals, and 200 other signals from various sensors (e.g., pressure, electrical resistance). These analog signals are multiplexed and digitized for processing by a Solar 16/40, 48 k word computer in real time. Output includes each signal which is outside preset limits, all the data acquired, average temperatures, temperature gradients, and graphic displays. Author (ESA)

N84-19451# European Space Research and Technology Center, Noordwijk (Netherlands).
SURFACE PROPERTY MEASUREMENT FOR SPACECRAFT THERMAL BALANCE TESTING
Y. Chaouat (Societe Europeene d'Etudes et d'Essais d'Environnement) and J. B. Walker *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 461-466 ref (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The response of second surface mirrors (SSM), Kapton blankets, and aluminized Kapton tape to energy radiated from 2500 k Tungsten filament lamps was measured, to study a thermal balance testing method for spacecraft too large for conventional xenon lamp solar simulators. For SSM, incidence angles > 20 deg show variation in absorption in xenon light, becoming greater in IR. There is a factor of almost 2 increase in absorptance in IR over xenon. Kapton blankets exhibit low sensitivity to the flux source differences. For Kapton tape, absorptance in the IR is reduced by a factor of 2 over xenon. Because absorptance and emittance are low, their accurate determination becomes difficult. Flux variations produce less response, so if the characteristics are determined, the impact upon design of IR lamp arrays will not be significant. Author (ESA)

N84-19452# Institute of Space and Astronautical Science, Tokyo (Japan).
MEASUREMENT OF INCIDENCE ANGLE DEPENDENCE OF SOLAR ABSORPTANCE c74
A. Ohnishi and T. Hayashi *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 467-470 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

For measuring solar absorptance dependence on incidence angle, an integrating sphere, in which the sample is fixed on the surface of the sphere, and the incident angle for the monochromatic beam on the surface is adjusted by the rotation of the integrating sphere, is proposed. Results for spacecraft materials are presented. Results for aluminized Teflon are 4% better compared with the standard method. Author (ESA)

N84-19453# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
EXACT SOLUTION FOR EMISSION FROM SURFACE ELEMENTS OF A PLANET c91
J. Doenecke *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 471-476 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A Monte Carlo method was employed to calculate Earth radiation absorbed by the German Infrared Laboratory spaceborne telescope, which has a highly specularly reflecting surface. For precise calculations the Earth cannot be simulated by a sphere in the standard approach, so equations which exactly provide the radiations from single Earth surface elements incident upon a flat plate were used. The deduction of these equations by Nusselt's projection method is outlined. It is proposed to replace the square-of-the-distance law by the equations. They can be incorporated in programs that also consider planetary radiations. Author (ESA)

N84-19454# Centre National d'Etudes Spatiales, Toulouse (France).
A MALTESE CROSS SHAPED MOBILE THERMAL CONTROL SHUTTER [VOLET MOBILE DE CONTROLE THERMIQUE DU TYPE CROIX DE MALTE]
I. Alet *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 477-480 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The advantages of a Maltese cross shaped shutter over venetian blind type systems for satellite thermal control are described. It has low power consumption, is mechanically simple, and can be used against the Sun. Its low surface efficiency makes it unsuitable for geostationary telecommunication satellites, but presents no problems in low Earth orbit. Thermal, vibration, and shock tests demonstrate its robustness and reliability. Author (ESA)

N84-19455# Centre National d'Etudes Spatiales, Toulouse (France).
GEOSTATIONARY SATELLITE WITH SUN POINTING PLATFORM AND GEOCENTRIC PAYLOAD [SATELLITE GEOSTATIONNAIRE A PLATE-FORME POINEE SOLEIL ET CHARGE UTILE GEOCENTRIQUE] c15
I. Alet *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 481-485 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A Sun pointing geostationary satellite architecture which gives radiator outputs twice as large a traditional north-south configurations is described. The geocentric payload is protected from solar radiation by a screen, but needs an important network of heat pipes. Black paint can be used for the radiators, overcoming aging problems. Thermal testing is much simpler than for traditional designs. Author (ESA)

N84-19456# Thomson-CSF, Toulouse (France).
THERMAL CONTROL OF THE SPOT SATELLITE PAYLOAD TELEMETRY [LE CONTROLE THERMIQUE DE LA TMCU DU SATELLITE SPOT] c15
G. Racaud, B. Dantin, and P. Lelievre *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 487-493 refs In FRENCH; ENGLISH summary (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Thermal control modeling of the SPOT payload telemetry (TMCU) to ensure temperature levels for five nominal operating modes and the survival mode is outlined. The general model has 200 nodes, 3 thermically decoupled subsystems: the ultra high frequency panel, the antenna and the telemetry unit. In each subsystem, exchange is radiative. In order optimize the TMCU radiating window openings with respect to the minimum consumption of the telemetry unit (TU) heating system necessary for the cold cases, a passive control for the TMCU and an active control for the TU's heaters (regulated by the computer on board on standby and the twin-blade thermostats in survival mode) were developed. The vacuum Sun test validates the design and after the model was reset it simulated test temperatures at better than 3 C. Author (ESA)

N84-19457# European Space Research and Technology Center, Noordwijk (Netherlands).
ACCURATE THERMAL CONTROL OF ENCLOSURES OF OPTICAL PAYLOADS c19

E. Jaekel, R. Best (DSF, Friedrichshafen, West Germany), and G. Soulat (Matra Service Aerodynamique, Toulouse) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 495-499 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The Faint Object Camera and Hipparcos payload thermal control enclosure design is presented. The thermal control system decouples the enclosure from the external thermal environment and compensates internal and/or external thermal disturbances by controlled heat dissipation of heater mats installed internally. This system is able to control structures and optical elements to < 0.25 C temperature excursions and 0.1 C gradient changes within 24 hr. Author (ESA)

N84-19458# European Space Research and Technology Center, Noordwijk (Netherlands).
THE LARGE SPACE SIMULATOR (LSS) AT ESA/ESTEC (A SUMMARY OF THE MAIN CHARACTERISTICS) **c14**
P. W. Brinkmann *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 501-503 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

Parameters of ESA's Space Simulator for thermal balance tests on satellites and satellite equipment with large geometries are listed. A vertical main chamber and horizontal auxiliary chamber are interfaced by a 8 m dia nozzle. Main chamber and nozzle will be equipped with a shroud lining the complete chamber surface, while the shroud elements in the auxiliary chamber have the form of light baffles. The collimation mirror is suspended from the rear stiffening ring of the auxiliary chamber. A spout provides the interface between the vacuum chamber and the lamp house. The lamp house contains 19 lamp modules, collection optics and transfer optics and provides a protective environment for all optical elements. The test articles can be mounted on a vibration-free support platform (eventually via a motion simulator) or suspended from support lugs in the upper part of the main chamber. Author (ESA)

N84-19459# Science Research Council, Chilton (England). Rutherford Appleton Lab.
CALCULATION OF TWO-DIMENSIONAL FOCUSING FACTOR DISTRIBUTION DUE TO SPECULAR FLUX TRANSFER BETWEEN GENERAL CURVES **c34**
D. M. Simpson *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 505-520 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

A method of calculating the distribution of flux due to specular energy transfer, allowing for multiple reflections and varying specularity with angle of incidence is presented. The resultant distribution at the target surface is given in terms of the ratio of flux intensity on the target to the intensity of the incident energy of the specular curve. This ratio is referred to as the focusing factor. A problem encountered by reflections from the Space Shuttle radiators onto experiments in the payload bay, and a case which illustrates how serious a problem specular heat transfer can be treated. Author (ESA)

N84-19460# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
THE NEW SPACE SIMULATION AND THERMAL VACUUM FACILITY WSA/TVA **c14**
H. E. Nuss and J. Reimann *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 521-526 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The thermal testing capabilities of the space simulation and thermal vacuum facility WSA/TVA are described. It has usable test volume of 6 m dia and 7 m length, collimated solar beam diameter of 3.5 m and handling equipment with motion simulator for test articles up to 2000 daN. The vacuum chamber is a horizontal stainless steel cylinder of 6.8 m diameter and 13 m length. The high vacuum pressure of < 0.000002 mbar is achieved by 6 helium refrigerator cyropumps; the operation capabilities of the thermal shroud are in the range 100 to 420 K. Author (ESA)

N84-19461# Aeritalia S.p.A., Torino (Italy). Space Sector.
SIMPLIFICATION OF THERMAL DESIGN BY THE USE OF EFFECTIVE SINK TEMPERATURE METHOD **c34**
C. Chiarelli and F. Al-Astrabadi *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 527-530 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The validity of the effective sink temperature as a method to support the thermal design and analysis of a variety of payloads, systems and subsystems integrated within a single project and subjected to common boundary environment, is shown. The basic equation which combines terms representing various thermal contributions of the radiative heat transfer environment is presented. The utilization of this approach with Hipparcos and a thethered satellite is outlined. Author (ESA)

N84-19462*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
STARPROBE THERMAL SHIELD EVOLUTION **c24**
J. M. Millard, R. N. Miyake, R. B. Dirling (Science Applications Inc., Irvine, Calif.), A. Rolfo (CNES, Toulouse), and C. Royere (CNRS, Font-Romeu, France) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 531-560 refs Sponsored by NASA (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

The evolution of the Starprobe thermal shield from mission requirements through a preliminary design concept is traced. The diverse environments the spacecraft must survive (ranging from Jovian to near-Sun coronal) established requirements resulting in carbon-carbon material being selected for shield construction for a three axis stabilized spacecraft. Thoriated tungsten is a backup material for spin-stabilized concepts. The preliminary shield design, while being essentially immune to radiation degradation and significant meteoroid threats, provides a thermal environment that insures proper operation of the payload (below 55 C) at perihelion (4 solar radii from the Sun's center) and prevents total mass loss rates from exceeding 2.5 mg/sec, insuring proper operation of fields and particles instruments. It also meets these requirements at perihelion when off-nadir pointing 10 deg, thus insuring desired imaging activity. Author (ESA)

N84-19463# Air Force Geophysics Lab., Hanscom AFB, Mass.
SHEATH IONIZATION MODEL OF BEAM EMISSIONS FROM LARGE SPACECRAFTS
S. T. Lai, H. A. Cohen, K. H. Bhavnani (Radex, Inc.), and M. F. Tautz (Radex, Inc.) 30 Dec. 1983 14 p Presented at the Spacecraft Environ. Interactions Technol. Conf., Colorado Springs, 4-6 Oct. 1983
(AF Proj. 7661)
(AD-A137181; AFGL-TR-83-0331) Avail: NTIS HC A02/MF A01 CSCL 22/1

An analytical model of the charging of a spacecraft emitting electron and ion beams has been applied to the case of large spacecraft. In this model, ionization occurs in the sheath due to the return current. Charge neutralization of spherical space charge flow is examined by solving analytical equations numerically. Parametric studies of potential large spacecraft are performed. As in the case of small spacecraft, the ions created in the sheath by the returning current play a large role in determining spacecraft potential. Author (GRA)

N84-19464# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DECENTRALIZED CONTROL OF A LARGE SPACE STRUCTURE USING DIRECT OUTPUT FEEDBACK M.S. Thesis
D. V. Thyfault Dec. 1983 140 p
(AD-A136781; AFIT/GA/AA/83D-8) Avail: NTIS HC A07/MF A01 CSCL 12/1

Direct output feedback control methods are used to develop a multiple-input multiple-output controller. The controller is then

applied to the Charles Stark Draper Laboratory 2 (CSDL 2) model. The CSDL 2 model is a sophisticated optical space structure representative of large flexible space structures. This model consists of 59 nodes and 23 lumped masses. The beam elements are fully connected and may support axial, transverse, and torsional deformations. NASTRAN is employed to generate modal approximations of the model as well as the mode shapes and frequencies of the resulting modes. Of the numerous modes available for the model, only the first 35 modes are utilized and implemented in the controller. The control problem is formulated in state space form and direct output feedback is implemented. The state is represented as modal amplitudes and rates. System outputs are obtained by rate sensors and control is applied by point force actuators. GRA

N84-19465# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE EFFECT OF MASS AND STIFFNESS CHANGES ON THE DAMPING FACTOR IN A LARGE SPACE STRUCTURE AS REPRESENTED BY THE CSDL 2 MODEL M.S. Thesis
David E. Olsen Dec. 1983 132 p
(AD-A136984; AFIT/GSO/AA/83D-2) Avail: NTIS HC A07/MF A01 CSCL 22/2

This investigation was undertaken to determine the sensitivity of the damping factor in a large space structure (LSS) to small changes in nonstructural mass and structural element stiffness. Revision 3 of the ACOSS 2 model, developed by the Charles Stark Drapes Laboratory, Inc. (CSDL), was used as the model of the LSS. Various combinations of the mirror masses in this large space telescope were varied by up to 10%, selected structural elements were stiffened by increasing their cross-sectional areas by 10 and 50%, and, finally, two structural elements in the middle of the telescope were stiffened to represent the addition of a lumped mass located away from the control system sensors and actuators. A control system of 21 collocated sensors and actuators, positioned at the top and bottom of the telescope, was used in this analysis. The analysis was accomplished using NASTRAN for the finite element analysis, and, after selecting certain vibration modes for further study, the complex conjugate pairs used to determine the damping factors were calculated. The results indicate that the damping factors for the CSDL model are quite sensitive to small perturbations and that it is very difficult to predict the effect that a perturbation to the model will have on the damping factors. GRA

N84-19466# Naval Research Lab., Washington, D. C.
MULTI-ELEMENT X-RAY SHIELDS FOR SPACECRAFT Final Report, 1981 - 1983
W. L. Bendel 30 Dec. 1983 21 p
(AD-A137105; NRL-MR-5248) Avail: NTIS HC A02/MF A01 CSCL 18/6

Spacecraft electronics must be shielded against the X-rays of a distant nuclear weapon. The optimum shielding material is a mixture of heavy elements. Rads(Si) are calculated for some materials and thicknesses. Author (GRA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N84-19416# Ball Aerospace Systems Div., Boulder, Colo.
ONE YEAR OF STARS, PROVIDED BY THE IRAS CRYOGENIC SYSTEM
A. R. Urbach, R. A. Hopkins, and P. V. Mason (JPL, Pasadena, Calif.) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 171-177 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19417# European Space Research and Technology Center, Noordwijk (Netherlands).
THERMAL DESIGN OF INFRARED SPACE OBSERVATORY (ISO) PAYLOAD DUAL COOLING
F. Franco and M. Sander (MBB, Ottobrunn, West Germany) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 179-190 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19418# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
DESIGN AND TEST OF A CRYOGENIC PHASE SEPARATOR FOR ZERO-G ENVIRONMENT
M. Mueller, A. Seidel, and J. Lizon-Tati (ESTEC, Noordwijk, Netherlands) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 191-196 (For primary document see N84-19396 10-18)
(Contracts ESA-4596/81/NL-AK(SC); ESA-5325/83/NL-PB(SC))
Avail: NTIS HC A25/MF A01

N84-19419# MATRA Service Aerodynamique, Toulouse (France). Space Instrumentation Div.
ACTIVE THERMAL CONTROL OF THE FAINT OBJECT CAMERA
G. Soulat *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 197-205 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19420# European Space Research and Technology Center, Noordwijk (Netherlands).
SUPERFLUID HELIUM CRYOSTAT FOR SPACE UTILIZATION (CRHESUS): DEVELOPMENT AND TEST OVERVIEW [CRYOSTAT A HELIUM SUPERFLUIDE POUR UTILISATION SPATIALE CHRESUS: BILAN DU DEVELOPMENT ET DES ESSAIS]
J. Lizon-Tati, D. Imbert (SNIAS, Cannes, France), and M. Till (Air Liquide, Sassenage, France) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 207-216 refs In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19441# Centre National d'Etudes Spatiales, Toulouse (France).
THERMAL CONTROL OF THE SPOT HRV INSTRUMENT [CONTROLE THERMIQUE DE L'INSTRUMENT HRV]
J. Mauduyt, G. Bonnet (Matra Service Aerodynamique, Toulouse), and Y. Toulemont (Matra Service Aerodynamique, Toulouse) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 381-389 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19443# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Thermal Control Section.
THERMAL DESIGN FEATURES OF ROSAT X-RAY TELESCOPE
R. E. Benz, U. G. Hingst, and W. J. Schwarzott *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 399-406 Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19457# European Space Research and Technology Center, Noordwijk (Netherlands).
ACCURATE THERMAL CONTROL OF ENCLOSURES OF OPTICAL PAYLOADS
E. Jaekel, R. Best (DSF, Friedrichshafen, West Germany), and G. Soulat (Matra Service Aerodynamique, Toulouse) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 495-499 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-19467*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
ADVANCED ION THRUSTER RESEARCH Annual Report, 1 Oct. 1982 - 1 Nov. 1983
Paul J. Wilbur Jan. 1984 139 p refs
(Grant NGR-06-002-112)
(NASA-CR-168340; NAS 1.26:168340) Avail: NTIS HC A07/MF A01 CSCL 21C

A simple model describing the discharge chamber performance of high strength, cusped magnetic field ion thrusters is developed. The model is formulated in terms of the energy cost of producing ions in the discharge chamber and the fraction of ions produced in the discharge chamber that are extracted to form the ion beam. The accuracy of the model is verified experimentally in a series of tests wherein the discharge voltage, propellant, grid transparency to neutral atoms, beam diameter and discharge chamber wall temperature are varied. The model is exercised to demonstrate what variations in performance might be expected by varying discharge chamber parameters. The results of a study of xenon and argon orificed hollow cathodes are reported. These results suggest that a hollow cathode model developed from research conducted on mercury cathodes can also be applied to xenon and argon. Primary electron mean free paths observed in argon and xenon cathodes that are larger than those found in mercury cathodes are identified as a cause of performance differences between mercury and inert gas cathodes. Data required as inputs to the inert gas cathode model are presented so it can be used as an aid in cathode design. Author

N84-19468*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
ION EXTRACTION CAPABILITIES OF TWO-GRID ACCELERATOR SYSTEMS M.S. Thesis
Dean C. Rovang and Paul J. Wilbur Feb. 1984 111 p refs
(Grant NGR-06-002-112)
(NASA-CR-174621; NAS 1.26:174621) Avail: NTIS HC A06/MF A01 CSCL 21C

An experimental investigation into the ion extraction capabilities of two-grid accelerator systems common to electrostatic ion thrusters is described. This work resulted in a large body of experimental data which facilitates the selection of the accelerator system geometries and operating parameters necessary to maximize the extracted ion current. Results suggest that the impingement-limited perveance is not dramatically affected by reductions in screen hole diameter to 0.5 mm. Impingement-limited performance is shown to depend most strongly on grid separation distance, accelerator hole diameter ratio, the discharge-to-total accelerating voltage ratio, and the net-to-total accelerating voltage ratio. Results obtained at small grid separation ratios suggest a new grid operating condition where high beam current per hole levels are achieved at a specified net accelerating voltage. It is shown that this operating condition is realized at an optimum ratio of net-to-total accelerating voltage ratio which is typically quite high. The apparatus developed for this study is also shown to be well suited measuring the electron backstreaming and electrical breakdown characteristics of two-grid accelerator systems. Author

N84-19469*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LOW LOSS INJECTOR FOR SPACE SHUTTLE MAIN ENGINE. CENTER DIRECTOR'S DISCRETIONARY FUND Final Report
George L. vonPragenau Feb. 1984 21 p
(NASA-TM-82567; NAS 1.15:82567) Avail: NTIS HC A02/MF A01 CSCL 21H

An efficient propellant injection method to raise the Space Shuttle Main Engine (SSME) thrust and payload is discussed. Relatively large diameter injector elements with low pressure loss are recommended for the main combustion chamber and the pre-burners. Smaller losses admit more propellant flow which then raises thrust. Payload is not only gained by specific impulse but also by thrust. The chamber pressure is stabilized by selecting the proper cavity size for the injector elements while reducing the injection pressure loss which normally is kept high for stability. The rather large injector element recesses provide acoustic damping which makes baffles and acoustic absorbers unnecessary. A tenfold reduction of flow induced stresses which are rather high in the present design is shown. Relaxed tolerances, fewer elements, and better maintenance are offered. The study was conducted under a center director discretionary fund assignment. Author

N84-19470*# National Aeronautics and Space Administration, Washington, D. C.
FLOW PROCESSES IN OVEREXPANDED CHEMICAL ROCKET NOZZLES. PART 1: FLOW SEPARATION
Robert H. Schmucker Jan. 1984 55 p refs Transl. into ENGLISH of "Stroemungsvorgaenge beim Betrieb Uberexpandierter Duessen Chemischer Reketentriebwerke. Teil 1: Stroemungsablosung" rept. TUM-LRT-TB-7 Technische Univ., Munich, 3 Jul. 1973 p 1-60 Original language document was announced as N75-26011 Transl. by Kanner (Leo) and Associates, Redwood City, Calif. Sponsored by NASA, US Academy of Sciences and Deutsche Forschungsgemeinschaft
(Contract NASw-3541)
(NASA-TM-77396; NAS 1.15:77396; TUM-LRT-TB-7) Avail: NTIS HC A04/MF A01 CSCL 21H

An investigation was made of published nozzle flow separation data in order to determine the parameters which affect the separation conditions. A comparison of experimental data with empirical and theoretical separation prediction methods leads to the selection of suitable equations for the separation criterion. The results were used to predict flow separation of the main space shuttle engine. Author

N84-19471*# National Aeronautics and Space Administration, Washington, D. C.
FLOW PROCESSES IN OVEREXPANDED CHEMICAL ROCKET NOZZLES. PART 2: SIDE LOADS DUE TO ASYMMETRIC SEPARATION
Robert H. Schmucker Feb. 1984 63 p refs Transl. into ENGLISH of "Stromungsvogange beim Betrieb Oberexpandierter Dosen Chemischer Raketentriebwerke. Teil 2: Seitenkrafte Durch Unsymmetrische Ablosung" rept. TUM-LRT-TB-10 Technische Univ., Munich, 15 Sep. 1973 p 1-60 Original language document was announced as N75-26012 Transl. by Scientific Translation Service, Santa Barbara, Calif. Sponsored by NASA, US Academy of Sciences and Deutsche Forschungsgemeinschaft
(Contract NASw-3542)
(NASA-TM-77395; NAS 1.15:77395; TUM-LRT-TB-10) Avail: NTIS HC A04/MF A01 CSCL 21H

Methods for measuring the lateral forces, occurring as a result of asymmetric nozzle flow separation, are discussed. The effect of some parameters on the side load is explained. A new method was developed for calculation of the side load. The values calculated are compared with side load data of the J-2 engine. Results are used for predicting side loads of the space shuttle main engine. Author

N84-19472*# O'Donnell and Associates, Inc., Pittsburgh, Pa.
DEVELOPMENT OF A SIMPLIFIED PROCEDURE FOR ROCKET ENGINE THRUST CHAMBER LIFE PREDICTION WITH CREEP Final Report
M. L. Badlani, J. S. Porowski, W. J. ODonnell, and D. B. Peterson Oct. 1983 87 p
(Contract NAS3-23343)
(NASA-CR-168261; NAS 1.26:168261; OAI-1512-11-83) Avail:

NTIS HC A05/MF A01 CSCL 21H

An analytical method for predicting engine thrust chamber life is developed. The method accounts for high pressure differentials and time-dependent creep effects both of which are significant in limiting the useful life of the shuttle main engine thrust chamber. The hot-gas-wall ligaments connecting adjacent cooling channels ribs and separating the coolant flow from the combustion gas are subjected to a high pressure induced primary stress superimposed on an alternating cyclic thermal strain field. The pressure load combined with strain-controlled cycling produces creep ratcheting and consequent bulging and thinning of these ligaments. This mechanism of creep-enhanced ratcheting is analyzed for determining the hot-gas-wall deformation and accumulated strain. Results are confirmed by inelastic finite element analysis. Fatigue and creep rupture damage as well as plastic tensile instability are evaluated as potential failure modes. It is demonstrated for the NARloy Z cases analyzed that when pressure differentials across the ligament are high, creep rupture damage is often the primary failure mode for the cycle times considered. Author

N84-19473# Royal Aircraft Establishment, Farnborough (England).
INVESTIGATION OF PULSED PERFORMANCE OF AN ELECTROTHERMAL HYDRAZINE THRUSTER, USING A SPECIAL SEE-THROUGH THRUSTER Technical Report
W. G. Grenham and S. P. Field Feb. 1983 34 p
(AD-A137408; RAE-TR-83018; DRIC-BR-89505) Avail: NTIS HC A03/MF A01 CSCL 22/2

A special see-through thruster was developed to investigate the pulse performance of a prototype 0.2N electrothermal hydrazine thruster (EHT), designed for spacecraft attitude control applications. Results from tests were recorded by high-speed cine photography, synchronized with analogue data records. These showed that the poor response of a prototype EHT was related mainly to the injection and vaporization characteristics of the propellant in the thrust chamber. Various phenomena are described and an indication is given to the interaction between these events during repeated pulsed operation. Conclusions are reached regarding design changes necessary to improve performance. Author (GRA)

N84-19474# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DISCONTINUOUS LOW THRUST ORBIT TRANSFER M.S. Thesis
J. R. Cass, Jr. Dec. 1983 64 p
(AD-A136908; AFIT/GA/AA/83D-1) Avail: NTIS HC A04/MF A01 CSCL 21/3

This paper examines the use of discontinuous low thrust for orbital transfers between two non-coplanar, circular orbits. The vehicle is assumed to be a solar-powered, ion rocket that cannot operate when it is within the Earth's shadow. Two timescales are used to derive a minimum fuel trajectory. The fast timescale solution maximizes a change in inclination when given a change in semi-major axis for a single orbit. The slow timescale solution combines fast timescale results to obtain the minimum fuel trajectory. Results are presented for three specific transfers requiring varying amounts of shadow penetration. It is shown that the fuel penalty caused by discontinuous thrust is small. However, there can be a moderate increase in total trip time if the time within the shadow is large. Author (GRA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-19475*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIRE-RETARDANT DECORATIVE INKS FOR AIRCRAFT INTERIORS
Zohar Nir (Makhteshim, Ltd.), John A. Mikroyannidis (Patras Univ.), and Demetrius A. Kourtides Feb. 1984 18 p refs
(NASA-TM-85876; A-9597; NAS 1.15:85876) Avail: NTIS HC A02/MF A01 CSCL 01C

Commercial and experimental fire retardants were screened for possible use wiith acrylic printing inks on aircraft interior sandwich panels. The fire retardants were selected according to their physical properties and thermostabilities. Thermostabilities were determined by thermogravimetric analysis and differential scanning calorimetry. A criterion was then established for selecting the more stable agent. Results show that some of the bromine-containing fire retardants are more thermostable than the acrylic ink, alone, used as a control. Also, the bromine-containing fire retardants yield even better limiting oxygen index values when tested after adding carboxy-terminated butadiene acrylonitrile (CTBN) rubber. Author

N84-19476*# National Aeronautics and Space Administration, Washington, D. C.
SYNTHESIS OF POLYAMIDES FROM DIAMINES OF THE FLUORENE SERIES
O. Ya. Fedotova, V. V. Korshak, and Ye. I. Nesterova Mar. 1984 12 p refs Transl. into ENGLISH from Vysokomol. Soedin., Ser. A (USSR), v. 15, no. 1, 1973 p 80-84 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77398; NAS 1.15:77398) Avail: NTIS HC A02/MF A01 CSCL 07C

Aromatic polyamides were prepared by polycondensation of isophthaloyl chloride and 2,7-diaminofluorene, 2,7-dimainofluorenone, or 2,5-diaminofluorenone in AcNMe2 or N-methyl-2-pyrrolidinone at 20 deg - 30 deg for 1.5-2 hr. Isophthaloyl chloride-2,5-diaminofluorenone copolymer [39609-29-51] was sol. in AcNMe2, N-methyl-2-pyrrolidinone, DMF, and hexamethylphosphoramide, whereas isophthaloyl chloride-2,7-diamino-fluorene copolymer [39609-30-3] and isophthaloyl chloride-2,7-diamino-fluorenone copolymer [39609-31-0] were not sol. in the solvents cited. The aromatic polyamides revealed thixotropic properties in 0.5% solutions in H2SO4. Author

24 COMPOSITE MATERIALS

Includes laminates.

N84-19477*# National Aeronautics and Space Administration, Washington, D. C.
RESIN COMPOSITION
Masahiro Shiozaki, Nobuya Igarashi, and Kiyokazu Tsunawaki Jul. 1982 15 p Transl. into ENGLISH of Japanese Patent No. 51-56849 (13 Nov. 1974) Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77457; NAS 1.15:77457) Avail: NTIS HC A02/MF A01 CSCL 11D

The invention relates to an incombustible resin composition produced by blending a compound with a specific ester bond and imide bond in a combustible resin. Author

N84-19478*# National Aeronautics and Space Administration, Washington, D. C.
FLEXIBLE SUBSTRATE FOR PRINTED WIRING
Masayoshi Asakura, Kenji Yabe, Hirofumi Tanaka, and Atsuhiko Soda Jul. 1982 15 p Transl. into ENGLISH of Japanese Patent No. 50-96899 (27 Dec. 1973) Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77459; NAS 1.15:77459) Avail: NTIS HC A02/MF A01 CSCL 11D

A very flexible substrate for printed wiring is disclosed which is composed of a blend of phenoxy resin-polyisocyanate-brominated epoxy resin in which the equivalent ration of the functional groups is hydroxyl grouped: isocyanate group: epoxy

group = 1:0.2 to 2:0.5 to 3. The product has outstanding solder resistance and is applied to metal without using adhesives. A.R.H.

N84-19479*# Textron Bell Helicopter, Fort Worth, Tex.
FLIGHT SERVICE EVALUATION OF COMPOSITE COMPONENTS ON THE BELL HELICOPTER MODEL 206L, FLIGHT SERVICE REPORT Annual Report
Herbert Zinberg Mar. 1984 37 p refs
(Contract NAS1-14279)
(NASA-CR-172296; NAS 1.26:172296; AR-1) Avail: NTIS HC A03/MF A01 CSCL 11D

The flight service components for the Bell Model 206L JetRanger helicopter are examined. The components were placed in service in the Continental United States, Canada, and Alaska. The status of 34 sets of components is discussed. Approximately 27,500 flight hours were accumulated on the components as of 1 August 1983. Three sets of components and one-fifth of the exposure coupons were returned and tested. The results are given. The overall behavior of the components and associated problems are discussed. Author

N84-19480# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanick.
CONTRIBUTION TO THE PROPERTIES OF CARBON FIBER REINFORCED COMPOSITES
Jan. 1983 265 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-849)
(DFVLR-Mitt-83-16; ESA-TT-849) Avail: NTIS HC A12/MF A01; DFVLR, Cologne DM 85

Environmental effects on carbon fiber reinforced composite mechanical properties; analysis of acoustic emissions, progression of defects in laminates; and development of a special finite element technique for the analysis of defects in composite structures are surveyed. For individual titles, see N84-19481 through N84-19484.

N84-19481# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
DETERMINATION OF CHARACTERISTIC VALUES FOR FIBER REINFORCED MATERIALS [KENNWERTBESTIMMUNG FUER FASERVERSTAERKTE WERKSTOFFE]
M. Gaedke *In its* Contrib. to the Properties of Carbon Fiber Reinforced Composites Jan. 1983 p 9-99 refs In GERMAN; ENGLISH summary (For primary document see N84-19480 10-24)
Avail: NTIS HC A12/MF A01

Environmental conditions in aeronautics and astronautics for fiber reinforced plastics and their effects are presented. Test measurements of temperature and moisture effects on mechanical properties of unidirectional CFRP laminates loaded by tension, compression and shear were performed. Numerical transfer of results to get a forecast of multilayer laminates behavior under environmental conditions is discussed. Thermal cycling tests were performed to demonstrate the capacity of resistance of CFRP against thermal fatigue problems in spacecraft applications.
Author (ESA)

N84-19482# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
METHODS FOR NONDESTRUCTIVE TESTS OF CFRP LAMINATES [METHODEN DER ZERSTOERUNGSFREIEN PRUEFUNG VON CFK-LAMINATEN]
J. Block *In its* Contrib. to the Properties of Carbon Fiber Reinforced Composites Jan. 1983 p 101-144 In GERMAN; ENGLISH summary (For primary document see N84-19480 10-24)
Avail: NTIS HC A12/MF A01

Nondestructive testing of CFRP laminates is discussed. Ultrasonic techniques, X ray techniques, and acoustic emission analysis were employed. It is found that ultrasonic testing is particularly suited for the detection of delaminations and that X ray techniques are suited for crack detection. Acoustic emission (AE) is suited for location and, with limitations, for the classification of AE sources. Author (ESA)

N84-19483# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
DAMAGE MECHANISMS IN DAMAGED CFRP LAMINATES [SCHADENSMECHANISMEN FEHLERBEHAFTETER CFK-LAMINATE]
L. Kirschke *In its* Contrib. to the Properties of Carbon Fiber Reinforced Composite Jan. 1983 p 145-189 In GERMAN; ENGLISH summary (For primary document see N84-19480 10-24)
Avail: NTIS HC A12/MF A01

Damage mechanisms in damaged carbon fiber reinforced plastics are described. Damages are delaminations and notches. The stacking sequence of the laminates is uni and multidirectional. Growth of delaminations by tension, compression and fatigue loads is reported. Crack propagation in notched laminates by tension load is shown. Damage tolerance, and the influence of environmental conditions are discussed. Author (ESA)

N84-19484# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
CALCULATION METHODS FOR FIBER REINFORCED COMPONENTS [BERECHNUNGSVERFAHREN FUER FASERVERBUND-BAUTEILE]
H. Eggers *In its* Contrib. to the Properties of Carbon Fiber Reinforced Composites Jan. 1983 p 191-264 refs In GERMAN; ENGLISH summary (For primary document see N84-19480 10-24)
Avail: NTIS HC A12/MF A01

Numerical investigations of damaged fiber reinforced structures are reviewed. Tridimensional stress state around a flaw within a larger structure was calculated. A finite layer element, which describes delaminations and layer cracks is developed.
Author (ESA)

N84-19485# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STRENGTH AND THERMAL SHOCK RESISTANCE OF SiC-BN COMPOSITES M.S. Thesis
P. G. Valentine 10 Dec. 1983 92 p
(AD-A136891; AD-E750159; AFIT/GAE/AA/83D-27) Avail: NTIS HC A05/MF A01 CSCL 11/2

The purpose of this investigation was to determine the mechanical behavior (i.e., strength and thermal shock resistance) of silicon-carbide/boron-nitride composites and to test D.P.H. Hasselman's theory for high/low modulus composites. The primary objectives of this study were, therefore, as follows: to experimentally determine the material properties and thermal stress resistance parameters for SiC-BN composites, to ascertain if the thermal stress resistance of SiC is significantly improved as predicted by Hasselman's theory, and to determine how the strength of SiC-BN composites varies with changes in BN-content and temperature.
GRA

N84-19486# Massachusetts Inst. of Tech., Cambridge. Technology Lab. for Advanced Composites.
FRACTURE, LONGEVITY (FATIGUE), DYNAMICS, AND AEROELASTICITY OF COMPOSITE STRUCTURES Final Report, 1 Jan. - 31 Dec. 1982
P. A. Lagace, J. W. Mar, and J. Dugundji Jun. 1983 151 p
(Grant AF-AFOSR-0071-82; AF Proj. 2307)
(AD-A137047; TELAC-83-11; AFOSR-84-0001TR) Avail: NTIS HC A08/MF A01 CSCL 11/4

The results of several investigations into the fracture, longevity (fatigue), dynamics, and aeroelasticity of composite materials are reported. The experimental work was conducted using Hercules graphite/epoxy prepreg in two forms: AS1/3501-6 unidirectional tape and A370-5H/3501-6 fabric. The topics discussed include unnotched tensile fracture, sensitivity to notches under tensile loading, nonlinear stress-strain behavior, compression specimen development, damage growth under cyclic load, and the flutter and divergence of graphite/epoxy wings. Author (GRA)

N84-19487# General Dynamics Corp., Groton, Conn. Electric Boat Div.
CHARACTERIZATION OF FIBER COMPOSITE FLYWHEELS BY

ULTRASONIC IMAGING TECHNIQUES
M. C. Tsao, R. H. Grills, G. A. Andrew, and A. P. Coppa (GE, Philadelphia) 1983 11 p refs Presented at the 14th Symp. on Nondestructive Evaluation, San Antonio, 19-21 Apr. 1983
(Contract W-7405-eng-48)
(DE84-004689; CONF-830430-3) Avail: NTIS HC A02/MF A01

A set of flywheels of different fiber composites was investigated ultrasonically by an ULTRA IMAGE 3 System. The 40 cm (16 in.) in diameter and 4.3 cm thick flywheels were studied in an immersion test with a 2.5 cm diameter, 1.5 MHz, conically focused transducer. By monitoring the amplitude of the back surface signals from the wheels and displaying the amplitude variations with different color bands, the internal structures of the wheels such as the fiber orientations and bonding distributions can be examined in detail. The baseline information concerning the integrity of these prototype flywheels, relative to different manufacturing processes, with and without ring shrink fit, is recorded. A consistent, reliance, and cost effective nondestructive testing technique for analyzing the internal bonding structures of fiber composites is described. DOE

N84-19488# General Electric Co., Philadelphia, Pa. Space Systems Div.
COMPOSITE RING-DISK FLYWHEEL DESIGN, FABRICATION AND TESTING
A. P. Coppa Aug. 1983 244 p refs
(Contract W-7405-eng-45)
(DE84-004761; UCRL-15566) Avail: NTIS HC A11/MF A01

A total of 19 rotors were fabricated, 14 of which were hybrid rotors with nominal energy storage of 250 wh at maximum speed. The other five rotors produced were simple laminated disks intended for obtaining biaxial strength evaluation under spin conditions. The prototype hybrid rotors were designed in accordance with available material design data. The design was optimized by selecting a desirable ring/disk interference fit that reflected additional design data. Rotors were spin tested to destruction, and demonstrated excellent ultimate energy densities. Ultrasonic tests were performed on a number of rotors. Hybrid rotors employing graphite fiber/flexible urethane composite rings shows that energy densities approaching 40 wh/lb ultimate and 28 wh/lb, 10(5) cycle operational are possible. DOE

N84-19489# Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.
SUPERCONDUCTIVITY IN FILAMENTARY EUTECTIC COMPOSITES Final Technical Report, 1 Jun. 1978 - 30 May 1983
Mark P. Zaitlin 30 May 1983 4 p
(Contract DE-AC02-78ER-04938)
(DE84-005167; DOE/ER-04938/5; COO-4938-5) Avail: NTIS HC A02/MF A01

The results of work performed on superconductivity in filamentary eutectic composites are summarized. They include the building of a low temperature laboratory, measurements on Th-Nb and Y-Nb filamentary eutectic composites, and calculation of the lower critical field in a composite system. DOE

N84-19490 Georgia Inst. of Tech., Atlanta.
MECHANICAL BEHAVIOR OF SUPERPLASTICALLY FORMED SANDWICH PANELS Ph.D. Thesis
Taiwhan David Kim 1983 144 p
Avail: Univ. Microfilms Order No. DA8327336

The superplasticity formed sandwich cores developed recently provide many advantages over the conventional honeycomb construction. The unusual properties of superplastic alloys allow considerable flexibility in the design of the core geometry. The fabrication method of the new sandwich core is much simpler than that of the honeycomb core. And, the problem of line contact bonding is eliminated by surface contact bonding. However, the understanding of the mechanical behavior of such structures is very limited. In order to increase the utility of such newly developed cores, the following topics are studied in this thesis: (1) least weight density of an N-sided polygonal shaped projection; (2) shear modulus of an N-sided polygonal shaped projection; (3) optimization of the shear modulus; (4) stress analysis of sandwich palen; and (5) cores with variable thickness.
Dissert. Abstr.

N84-19857# Florida Univ., Gainesville. Dept. of Engineering Sciences.
IMPACT LOADING IN FILAMENTARY STRUCTURAL COMPOSITES
R. L. Sierakowski and S. K. Chaturvedi *In* the Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 15, No. 10 Oct. 1983 p 13-31 refs (For primary document see N84-19855 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 11/4

N84-19892# Institut National des Sciences Appliquees de Lyon, Villeurbanne (France). Lab. de Mecanique des Structures.
DYNAMIC BEHAVIOR OF COMPOSITE LAYERED BEAMS BY THE FINITE ELEMENT METHOD
P. Trompette and R. Gaertner *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 151-157 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 11/4

N84-19462*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
STARPROBE THERMAL SHIELD EVOLUTION
J. M. Millard, R. N. Miyake, R. B. Dirling (Science Applications Inc., Irvine, Calif.), A. Rolfo (CNES, Toulouse), and C. Royere (CNRS, Font-Romeu, France) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 531-560 refs Sponsored by NASA (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-19491*# National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF THE THERMOPHYSICAL PROPERTIES OF HIGH-MELTING MATERIALS WITH THE AID OF A COMPLEX OF INSTRUMENTS
A. S. Bolgar, S. P. Gordiyenko, Ye. A. Guseva, A. G. Turchanin, B. V. Fenochka, and V. V. Fesenko Feb. 1984 14 p refs Transl. into ENGLISH from the mono. "Teplofisicheskiye Svoystva Tverdykh Veshchestv" Moscow, 1973 p 135-141 Previously announced as A74-45362 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77402; NAS 1.15:77402) Avail: NTIS HC A02/MF A01 CSCL 07D

The evaporation rate, vapor pressure, heats of evaporation reaction (sublimation, dissociation), enthalpy, electrical resistance, heat capacity, emissivity, and heat conductivity of various carbides, borides, sulfides, nitrides, selenides, and phosphides were investigated. A set of high temperature high vacuum devices, calorimeters (designed for operation at 400 to 1300 K and from 1200 K), and mass spectrometers, most of which were specially developed for these studies, is described. Author

N84-19492*# National Aeronautics and Space Administration, Washington, D. C.
METHOD OF REFINING 2,2-ISOPROPYLIDENEBIS-3,5- DIBROMOPHENYLENE-4-OXYDIETHANOL
T. Kobayashi, K. Nawata, and K. Hiratsuka Jul. 1982 7 p Transl. into ENGLISH of Japanese Patent No. 51-63161 (26 Nov. 1974)

Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77458; NAS 1.15:77458) Avail: NTIS HC A02/MF A01 CSCL 07D

A method of refining 2,2-isopropylidenebis-3,5-dibromophenylene-4-oxydiethanol is described which is characterized by recrystallization of 2,2-isopropylidenebis-3,5-dibromophenylene-4-oxydiethanol using one or more aromatic hydrocarbons such as benzene, xylene, toluene, ethylbenzene or pseudocumene. Author

N84-19493*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 12 MICRON BAND OF ETHANE: A SPECTRAL CATALOG FROM 765 cm(-1) TO 900 cm(-1)
A. K. Atakan (Tennessee Univ.), W. E. Blass (Tennessee Univ.), J. W. Brault (Tennessee Univ.), S. J. Daunt (Tennessee Univ.), G. W. Halsey, D. E. Jennings, D. C. Reuter, and J. Susskind Nov. 1983 156 p refs Submitted for publication
(Contract NAS5-26896)
(NASA-TM-85108; NAS 1.15:85108) Avail: NTIS HC A08/MF A01 CSCL 07D

The high resolution laboratory absorption spectrum of the 12 micro band of ethane gas is studied. The data were obtained using the McMath Solar Telescope 1 meter Fourier Transform interferometer at Kitt Peak National Observatory and tunable diode laser spectrometers at the University of Tennessee and NASA/Goddard Space Flight Center. Over 200 individual vibration rotation transitions were analyzed taking into account many higher order effects including torsional splitting. Line positions were reproduced to better than 0.001/cm. Both ground and upper state molecular constants were determined in the analysis. The experimental details, the analysis procedures and the results are addressed. A list of ethane transitions occurring near (14)CO2 laser lines needed for heterodyne searches for C2H6 in extraterrestrial sources is also included. A spectral catalog of the ethane nu sub g fundamental from 765/cm to 900/cm is provided. A high dispersion (1/cm 12 in.) plot of both the Kitt Peak interferometric data and a simulated spectrum with Doppler limited resolution, a table of over 8500 calculated transitions listed quantum number assignments, frequencies and intensities are provided. Author

N84-19494*# National Aeronautics and Space Administration, Washington, D. C.
STABILITY AND ELECTROKINETIC POTENTIAL OF SILICON CARBIDE SUSPENSIONS IN AQUEOUS ORGANIC MEDIA
B. V. Yeremenko, I. N. Lyubchenko, and I. Ye. Skobets Feb. 1984 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Khim. i Khim. Tekhnol. (USSR), v. 16, no. 2, 1973 p 206-209 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Kiev State Univ.
(Contract NASw-3542)
(NASA-TM-77428; NAS 1.15:77428) Avail: NTIS HC A02/MF A01 CSCL 07D

The method of electroosmosis was used to study the dependence of the electrokinetic potential of silicon carbide suspensions in mixtures of water -n. alcohol. The reasons for the dependence of the electrokinetic potential on the composition of the intermicellar liquid are discussed. Author

N84-19495*# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
COMBUSTION CHARACTERISTICS IN THE TRANSITION REGION OF LIQUID FUEL SPRAYS Annual Progress Report, Jan. 1983 - Jan. 1984
N. P. Cernansky, I. Namer, and R. J. Tidona Jan. 1984 28 p refs
(Grant NAG3-382)
(NASA-CR-175396; NAS 1.26:175396) Avail: NTIS HC A03/MF A01 CSCL 21B

A number of important effects were observed in the droplet size transition region in spray combustion systems. In this region, where the mechanism of flame propagation is transformed from diffusive to premixed dominated combustion, the following effects have been observed: (1) maxima in burning velocity; (2) extension of flammability limits; (3) minima in ignition energy; and (4) minima in NO(x) formation. Unfortunately, because of differences in experimental facilities and limitations in the ranges of experimental data, a unified description of these transition region effects is not available at this time. Consequently, a fundamental experimental investigation was initiated to study the effect of droplet size, size distribution, and operating parameters on these transition region phenomena in a single well controlled spray combustion facility. Author

N84-19496# SRI International Corp., Menlo Park, Calif.
STUDIES OF ELECTRON-BEAM-INDUCED DECOMPOSITION OF BENZENE Semiannual Technical Report
D. J. Eckstrom, J. S. Dickinson, and R. T. Rewick Dec. 1983 16 p
(Contract N00014-81-C-0208; ARPA Order 4128)
(AD-A137241; SRI-MP-83-196; SATR-3) Avail: NTIS HC A02/MF A01 CSCL 07/5

Experiments have been performed using a Febetron 706 electron beam to study the problems that may occur when benzene is introduced into an electron accelerator. We particularly address the problem of electron-induced fragmentation and polymerization into nonvolatile species that deposit on surfaces, leading to the possibility of surface breakdown in accelerating gaps. Our results show that the amounts of fragmentation and deposition are quite small for a finite number of e-beam pulses, but that problems could arise after extended periods of use. As a conservative design guideline, we estimate that the fragmentation cross section for high energy electrons on benzene is approximately 10 to the minus 16th power sq. cm. and that 10% of these collisions lead to surface deposits. Author (GRA)

N84-19497# Fluorochem, Inc., Azusa, Calif.
RESEARCH IN ENERGETIC COMPOUNDS Interim Summary Report, 1 Jan. - 31 Dec. 1983
T. G. Archibald and K. Baum Jan. 1984 42 p
(Contract N00014-78-C-0147)
(AD-A137484; Rept-2-6-ONR) Avail: NTIS HC A03/MF A01 CSCL 07/3

The synthesis of 1,3,3-trinitroazetidine was carried out by means of the reaction of 1-t-butyl-3-methanesulfonatoazetidine with sodium nitrite to give 1-t-butyl-3-nitroazetidine. Oxidative nitration gave 1-t-butyl-3,3-dinitroazetidine, and nitrolysis with acetyl nitrate gave 1,3,3-trinitroazetidine. Other routes were explored. 1-Benzhydryl-3,3-dinitroazetidine was obtained by nitrite displacement of 1-benzhydryl-3-methanesulfonatoazetidine, followed by oxidative nitration, but attempts to replace the benzhydryl group by nitrolysis, hydrogenation or bromination were unsuccessful. Nitration of 1-t-butyl-3-hydroxyazetidine, 3-methanesulfonatoazetidine, 3-carboxyazetidine and 3-hydroxyazetidine gave, respectively, 1-t-butyl-3-nitratoazetidine, 1-nitro-3-methanesulfonatoazetidine, 3-carboxy-1-nitroazetidine and 1-nitro-3-nitratoazetidine. Bromination of 2,4-dioximinoadamantane under mildly acidic conditions gave 2,4-dibromo-2,4-dinitroadamantane. Reactions of 2-oximinoadamantane, 2,4,-dioximinoadamantane and 2,6-dioximinobicyclo (3.3.1)-nonane with neutralized hypochlorous acid resulted in replacement of the oxime groups with gem-dichloro groups. GRA

N84-19498# Utah Univ., Salt Lake City.
ELECTROCHEMISTRY OF ANILINES. 2: OXIDATION TO DICATIONS, ELECTROCHEMICAL AND UV/VIS SPECTRO-ELECTROCHEMICAL INVESTIGATION
B. Speiser, A. Rieker, and S. Pons 6 Jan. 1984 62 p
(Contract N00014-83-K-0470)
(AD-A136949; AD-E001638; TR-19) Avail: NTIS HC A04/MF A01 CSCL 07/4

The electrochemical oxidation of 2,6-di-tert-butyl-4-R-anilines (R = C6H5, p-OCH3-C6H4 and p-N(CH3)2-C6H4) at the potentials of the second peak has been investigated. Dications could be observed and characterized by electroanalytical and spectroelectrochemical means. The cyclic voltammogram of the methoxy

compound has been simulated by the orthogonal collocation method. Products of bulk electrolysis have been identified. Two different sites of attack in the case of the methoxy compound were found. GRA

N84-19499# Utah Univ., Salt Lake City. Dept. of Chemistry.
VOLTAMMETRIC STUDIES OF ZOMEPIRAC SODIUM AND ITS DETERMINATION IN TABLETS BY DIFFERENTIAL-PULSE POLAROGRAPHY
L. G. Chatten (Alberta Univ.), Stanley Pons, and L. Amankwa (Alberta Univ.) 6 Jan. 1984 22 p Submitted for publication
(Contract N00014-83-K-0470; NR Proj. 359-718)
(AD-A136982; TR-24) Avail: NTIS HC A02/MF A01 CSCL 07/4

A simple differential-pulse polarographic method has been developed for the determination of Zomepirac Sodium in tablets. Britton-Robinson buffer pH 11.0 containing 5% v/v of Methanol was employed as the supporting electrolyte. The Ep occurs at -1.50 volts. Results obtained by the proposed method are in excellent agreement with those provided by both the official and the manufacturer's methods of assay. Commonly used tablet excipients were found not to interfere in the analyses.
Author (GRA)

N84-19500# Utah Univ., Salt Lake City. Dept. of Chemistry.
SIMULATION OF EDGE EFFECTS IN ELECTROANALYTICAL EXPERIMENTS BY ORTHOGONAL COLLOCATION. PART 4: APPLICATION TO VOLTAMMETRIC EXPERIMENTS
John F. Cassidy, Stanley Pons, A. Scott Hinman, and Bernd Speiser 6 Jan. 1984 28 p
(Contract N00014-83-K-0470)
(AD-A136988; TR-23) Avail: NTIS HC A03/MF A01 CSCL 07/4

Orthogonal collocation is used to simulate cyclic voltammograms that are influenced by non-linear diffusion due to edge effects at small disc electrodes. Author (GRA)

N84-19501# Massachusetts Inst. of Tech., Cambridge.
PHOTOCHEMICAL CONVERSION OF H-2Os-3(CO)10(P-DONOR) TO H-2Oc-3(CO)9(P-DONOR) IN SOLUTION AND ON HIGH SURFACE AREA SILICA Interim Technical Report
James G. Bentsen and Mark S. Wrighton 28 Dec. 1983 18 p Submitted for publication
(Contract N00014-75-C-0880; NR Proj. 051-579)
(AD-A136991; TR-40) Avail: NTIS HC A02/MF A01 CSCL 07/5

Near-UV irradiation of H2Os3(CO)10L yields conversion to the known coordinatively unsaturated H2Os3(CO)9L for L = PPh3 or PPh2Et in alkane solution at 298 K. Likewise, near-UV irradiation of an alkane suspension of (SiO2)-L'Os3(CO)10H2 yields (SiO2)-L'Os3(CO)9H2 where (SiO2)-L'Os3(CO)10H2 is the solid prepared by reaction of high surface area SiO2 with H2Os3(CO)10-(PPh2CH2CH2Si(OEt)3). The same photochemistry results at 77 K in rigid alkane glasses, but the initial (less than 5% conversion) product is not derived from loss of CO. Continued irradiation at 77 K yields H2Os3(CO)9L and CO, but H2Os3(CO)9L is only found in approx. 50% yield based on the amount of H2Os3(CO)10L consumed. Warming the irradiated sample to 298 K yields some regeneration of H2Os3(CO)10L and some additional H2Os3(CO)9L. GRA

N84-19502# Yale Univ., New Haven, Conn. Dept. of Mechanical Engineering.
INTERFACIAL TENSION BETWEEN WATER AND SELECTED SUPERHEATED LIQUIDS BY QUADRUPOLE OSCILLATIONS OF DROPS Ph.D. Thesis
Chaur-Jian Hsu Dec. 1983 151 p
(Contract N00014-76-C-0527)
(AD-A136996; TM-4) Avail: NTIS HC A08/MF A01 CSCL 07/4

A technique is presented for measuring the interfacial tension between two liquids, one of which may be in a metastable state. A drop of one liquid is acoustically levitated in the other liquid (host) and also acoustically driven into quadrupole shape oscillations. The frequencies associated with several phase angles near the quadrupole resonance of the drop and the diameter of the drop are measured, which allows the interfacial tension to be calculated given the densities of both the drop and the host liquids. Because the host liquid provides a very smooth and clean container for the levitated drop, and because the shape oscillation is excited acoustically, without contact with a solid surface, the drop may survive in the superheated state for a long enough time for the experiments to be conducted. A simplified model was developed for describing the free oscillation and forced oscillation of a drop freely suspended in a host. The results of the simplified model agree well with that of previous theories. The accuracy of this technique was tested by measuring the interfacial tension between water and each of two common liquids. GRA

N84-19503# Utah Univ., Salt Lake City. Dept. of Chemistry
ELECTROCHEMICALLY MODULATED INFRARED SPECTROSCOPY (EMIRS). EXPERIMENTAL DETAILS
A. Bewick (Southhampton Univ., Engl.), B. S. Pons (Hokkaido Univ., Sappora, Japan), J. W. Russell (Alberta Univ., Edmonton, Canada), and K. Kunimatsu (Oakland Univ., Rochester, Mich.) 6 Jan. 1984 32 p Submitted for publication
(Contract N00014-83-K-0470)
(AD-A137040; TR-18) Avail: NTIS HC A03/MF A01 CSCL 07/4

Electrochemically modulated infrared spectroscopy (EMIRS) has proven to be a highly sensitive in situ technique for the obtaining of vibrational spectra of species adsorbed on metal electrodes. This paper presents a description of the experimental details regarding the methods and equipment necessary for the EMIRS technique. Author (GRA)

N84-19504# Rochester Univ., N. Y. Dept. of Chemistry.
THE ROLE OF PHONONS IN THE EXCITATION AND RELAXATION OF ADSPECIES Interim Technical Report
A. C. Beri, K. T. Lee, and T. F. George Jan. 1984 13 p
(Contract N00014-80-C-0472)
(AD-A137066; UROCHESTER/DC/84/TR-47) Avail: NTIS HC A02/MF A01 CSCL 07/5

The IR laser excitation of an adbond is studied by both a quantum mechanical generalized master equation approach and a classical generalized Langevin approach. The role of phonons in the energy flow between the adbond and the surface is considered. The latter approach looks further at local heating via direct excitation of surface atoms. It is seen that the Markovian approximation is in general inadequate, and that local heating is an important mechanism for desorption. Author (GRA)

N84-19505# AeroChem Research Labs., Inc., Princeton, N. J.
IONIC MECHANISMS OF CARBON FORMATION IN FLAMES Annual Report, 1 Apr. 1981 - 31 Mar. 1982
H. F. Calcote and D. B. Olson Jan. 1983 58 p
(Contract F49620-81-C-0030; AF Proj. 2308)
(AD-A137079; AEROCHEM-TP-427; AFOSR-83-1298TR) Avail: NTIS HC A04/MF A01 CSCL 21/2

The chemi-ion ion-molecule mechanism of soot formation has gained further support by detailed studies of ion profiles through sooting flames. Langmuir probes have been used to obtain absolute ion concentrations in premixed acetylene-oxygen flames over a range of equivalence ratios extending from nonsooting to sooting flames. These data have been used in a preliminary calibration of the mass spectrometer. The effect of initial temperature on the tendency of several flames to soot has been measured. For a given premixed flame the tendency to soot decreases with increasing temperature but for a series of fuels with increasing tendency to soot, the temperature at which soot occurs increases with the tendency to soot. Ion concentrations will be measured in this set of flames. Calculations of particle electronics and coagulation rates have been initiated to determine whether the large molecular ions observed in sooting flames are the cause or effect of soot formation and in preparation for quantitative modeling of soot formation. Author (GRA)

N84-19506# California Univ., Santa Barbara. Inst. for Polymers and Organic Solids.
CHARGE STORAGE IN DOPED POLY(THIOPHENE)
T. C. Chung, J. H. Kaufman, A. J. Heeger, and F. Wudl 6 Jan. 1984 26 p
(Contract N00014-83-K-0450)
(AD-A137085; IPOS-ONR-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

This paper presents a new method of electrochemical polymerization of poly(thiophene) using dithiphene as the starting material, from which a high quality film with a sharp interband absorption edge is obtained. An in situ study of the absorption spectrum during the electrochemical doping process has been carried out. In the dilute regime, the results are in detailed agreement with charge storage via bipolarons; weakly confined soliton pairs with confinement parameter gamma = 0.1-0.2. At the highest doping levels, the data are characteristic of the free carrier absorption expected for a metal. From a parallel electrochemical voltage spectroscopy (EVS) study, we find evidence of charge injection near the band edge and charge removal from the bipolaron gap states. In the dilute regime, the position of the chemical potential is consistent with charge storage in weakly confined bipolarons. The high Coulombic recovery over a charge-discharge cycle indicates that poly(thiphene) may be an excellent cathode-active material in battery applications. GRA

N84-19507# FilmTec Corp., Minneapolis, Minn.
TEMPERATURE-RESISTANT ELEMENTS FOR REVERSE OSMOSIS TREATMENT OF HOT PROCESS WASTE Final Report
R. J. Peterson, J. N. Thorpe, J. E. Cadotte, and J. Y. Koo Dec. 1983 75 p refs
(Contract DE-FC07-82ID-12423)
(DE84-005190; DOE/ID-12423/T1) Avail: NTIS HC A04/MF A01

An experimental program was conducted studying the mechanisms of performance loss in reverse osmosis elements operated at combinations of high temperature (60 to 85 C) and pressure (200 to 800 psig). The FilmTec FT-30 thin-film-composite membrane was used in these studies. Compaction of the aromatic polyamide barrier layer in the FT-30 membrane was identified as one cause of permeate flux loss above a threshold temperature of 50 C. This flux loss could not be eliminated through membrane modification experiments. However, fluxes at 60 to 85 C were still economically attractive, because the degree of flux loss was almost fully offset by increased permeate flux as a function of increased temperature. Spiral wound membrane elements showed severe performance loses during short and intermediate terms studies at high temperature and pressure. Compaction and collapse of the permeate channel materials were the primary reason. These materials consist of multifilament Dacron fabrics stiffened by a post-treatment with melamine-formaldehydr or epoxy resin. DOE

N84-19508# California Univ., Berkeley. Lawrence Berkeley Lab.
DENSITY OF SODIUM CHLORIDE SOLUTIONS AT HIGH TEMPERATURES AND PRESSURES
S. L. Phillips, H. Ozbek, and L. F. Silvester Jun. 1983 54 p refs Presented at Natl. Meeting of the Am. Inst. of Chem. Engr., Denver, 28 Aug. 1983
(DE84-004883; LBL-16275) Avail: NTIS HC A04/MF A01

A correlation equation is given which reproduces the density of sodium chloride solutions to + or - 4% over the ranges 0 to 5 molal, 0 to 350 C and 1 to 1000 bars. Data generated from the equation are compared with selected experimental and smoothed values at typical temperatures, pressures and concentrations. Data are included for the density of sea water concentrates up to 150 C and 150 g/kg salinity at saturation vapor pressures based on a fit to a Chebyshev polynomial. DOE

N84-19509# Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Science.
CONTINUOUS CHEMICAL REACTION CHROMATOGRAPHY Progress Report, 1 Nov. 1982 - 15 Nov. 1983
Rutherford Aris and Robert W. Carr, Jr. 1983 27 p refs
(Contract DE-AC02-76ER-02945)
(DE84-004089; DOE/ER-02945/7) Avail: NTIS HC A03/MF A01

A model of a moving bed reactor was studied in which a reversible first order heterogeneous reaction takes place on catalyst particles passing downwards through an upcoming stream of gas. By the analysis of the transient model and the one in which the rate of adsorption is finite, insight is gained into the formation of boundary and internal discontinuities in the ideal case. The reactor behavior as described by the ideal model solution was examined for different values of feed concentrations and reactor length. Reaction and separation is achieved simultaneously and the yield of the reversible reaction is greatly improved. Indeed the configuration of the reactor and its operating conditions are tailored so as to exceed the performance of a fixed bed both in yield and product purity. A laboratory scale countercurrent moving bed chromatographic reactor was designed and built. An experimental investigation of reactor performance is currently in progress. DOE

N84-19510# Clemson Univ., S.C. Dept. of Chemistry.
INTRAMOLECULAR ENERGY TRANSFER REACTIONS AS A METHOD FOR METAL COMPLEX ASSISTED PRODUCTION OF HYDROGEN Biannual Report, 15 Feb. 1982 - 1 Dec. 1983
John D. Petersen 1983 21 p refs
(Contract DE-AS09-80ER-10671)
(DE84-004762; DOE/ER-10671/2; BAR-2) Avail: NTIS HC A02/MF A01

The absorption of energy in one portion of a polymetallic complex, transferring that energy to another portion of the molecule, and allowing this remote center to undergo a desired chemical reaction is considered. Advantages of this intramolecular energy transfer process over the more common intermolecular processes are that the inherent inefficiencies of bimolecular collisional processes can be circumvented and that coupling of more than one metal fragment into one complex, each fragment having different properties, (i.e., light absorbing, reacting, etc.) allows the ultimate flexibility in the design of the overall system. The reactant molecules were divided into three component parts: the antenna fragment (highly absorbing metal center), the reactive fragment (center that undergoes reaction), and the bridge (ligand that connects and couples the two metal centers). Most of the systems studied contain the bridging ligand 2,2'-bipyrimidine, which functions as a chelate to both the antenna and reactive fragment. DOE

N84-19511# State Univ. of New York, Stony Brook.
METAL OXIDE ANODES FOR THE PHOTOELECTROCHEMICAL GENERATION OF OXYGEN Final Report, 24 Sep. 1981 - 30 Sep. 1983
Sumner Levine, Fu T. Lious, Kamran Hakim, and Chiang Yang (Brookhaven National Lab.) 30 Sep. 1983 157 p refs
(Contract DE-AC02-80ET-25209)
(DE84-004168; DOE/ET-25209/1) Avail: NTIS HC A08/MF A01

Practical photoelectrodes for use in the photoelectrolysis of water were investigated. Evidence is provided for an operative TiO2/Fe2O3 heterojunction anode. Unexplained instabilities were observed with TiO2 anodes when operated in excess of 100 hs. Studies on polycrystalline In2O3 indicated photoefficiencies comparable to that of single crystal material. Efforts to improve the efficiency of polycrystalline In2O3 by the addition of Y2O3 were unsuccessful. Studies were also conducted on solid state electrochemical techniques for doping TiO2 with fluoride. A 30% increase in efficiency was noted at relatively low levels but a decrease was observed at higher doping levels. DOE

N84-19512# Oak Ridge Associated Universities, Tenn.
SENSITIVE COLLINEAR LASER SPECTROSCOPY ON FAST ATOM AND ION BEAMS
H. K. Carter, P. Juncar, J. A. Bounds, C. R. Bingham, D. J. Pegg, and W. Fairbank, Jr. 1983 6 p refs Presented at 27th Ann. Intern. Tech. Symp. on High Speed Photo. Videography and Photonics, San Diego, Calif., 21 Aug. 1983
(Contracts DE-AC05-76OR-00033; DE-AS05-76ER-04936; DE-AS05-76ER-05034)

(DE84-003403; CONF-830874-32) Avail: NTIS HC A02/MF A01

A fiber optic light collector was constructed to efficiently guide photons from a long narrow source onto the face of a photomultiplier. A brief review of the technique of collinear laser fast atom beams and describe the performance of this new collector in such a collinear system is presented. DOE

N84-19513# Los Alamos Scientific Lab., N. Mex. Analytical Chemistry Group.

LINE WIDTH AND LINE SHAPE ANALYSIS IN THE INDUCTIVELY COUPLED PLASMA BY HIGH RESOLUTION FOURIER TRANSFORM SPECTROMETRY

L. M. Faires, B. A. Palmer, and J. W. Brault 1984 37 p refs Presented at Winter Conf. on Plasma Spectrochem., San Diego, Calif., 2 Jan. 1984

(Contract W-7405-eng-36)

(DE84-004358; LA-UR-83-3713; CONF-840101-1) Avail: NTIS HC A03/MF A01

High resolution Fourier transform spectrometry was used to perform line width and line shape analysis of 81 iron emission lines in the spectral range 290 to 390 nm originating in the normal analytical zone of an inductively coupled plasma. Computer programs using nonlinear least squares fitting techniques for line shape analysis were applied to the fully resolved spectra to determine Gaussian and Lorentzian components of the total observed linewidth. The effect of noise in the spectrum on the precision of the line fitting technique was assessed, and the importance of signal to noise ratio for line shape analysis is discussed. Translational temperatures are calculated from the Gaussian components of the linewidth. The excitation temperature of iron is determined from the same spectral data by the spectroscopic slope method based on the Einstein-Boltzmann expression for spectral intensity. DOE

N84-19514# California Univ., Berkeley. Lawrence Berkeley Lab.

SOLID ELECTROLYTE DEGRADATION: PROBLEMS AND SOLUTIONS

L. C. DeJonghe Sep. 1983 10 p refs Presented at the DOE/EPRI Beta Battery Workshop, Washington, D.C., 18 Oct. 1983

(Contract DE-AC03-76SF-00098)

(DE84-002916; LBL-16716; CONF-8310241-1) Avail: NTIS HC A02/MF A01

Degradation phenomena in sodium beta aluminas is reviewed. The theories and experimental results permit the formulation of suggestions for further electrolyte and cell development that could lead to improved battery performance. The indications are that conditions exist where degradation of the electrolyte itself may be avoided. DOE

N84-19515# Mound Lab., Miamisburg, Ohio.

DETERMINATION OF Cr(6) AND Cr(3) BY ICP

L. T. Brehm, Y. G. Ishida, and R. J. Finney 1983 18 p refs Presented at the 31st Natl. Technician Symp., Denver, 28 Aug. 1983

(DE83-016627; MLM-3093(OP); CONF-8308154-1) Avail: NTIS HC A02/MF A01

The extraction separation of Cr(6) and Cr(3), the development of an inductively coupled plasma (ICP) procedure for the quantitative determination of Cr(6) and Cr(3), and the application of the procedure to the analysis of pyrotechnic materials were investigated. DOE

N84-19516# Brigham Young Univ., Provo, Utah. BYU Catalysis Lab.

METAL-SUPPORT INTERACTIONS: THEIR EFFECTS UPON ADSORPTION, ELECTRONIC, AND ACTIVITY/SELECTIVITY PROPERTIES OF COBALT IN CO HYDROGENATION Annual Progress Report, 1 Apr. 1982 - 31 Mar. 1983

Calvin H. Bartholomew 29 Apr. 1983 14 p refs

(Contract DE-AC02-81ER-10855)

(DE83-013012; DOE/ER-10855/2) Avail: NTIS HC A02/MF A01

During the past year, measurements of dispersion, extent of reduction, H2 and CO adsorption stoichiometries, CO hydrogenation activity and selectivity, and H2 adsorption/desorption kinetics were conducted on 18 catalysts. Hydrogen adsorption was found to be highly activated and quite reversible; the adsorption stoichiometry corresponds to one hydrogen atom per surface cobalt atom. CO adsorption stoichiometries on the other hand vary considerably with support, dispersion, and preparation. Binding energies and adsorption states for H2 on cobalt vary with support. Activity and selectivity in CO hydrogenation on cobalt vary with support, dispersion, and preparation. The specific activity and selectivity for heavier hydrocarbons decrease with increasing dispersion. DOE

N84-19517# Karlsruhe Univ. (West Germany). Fakultaet fuer Mathematik.

SOLUTION OF THE RIEMANN PROBLEM FOR A POLYTROPIC GAS

Eberhard Halter Dec. 1982 22 p refs In GERMAN Sponsored by Bundesministerium fuer Forschung und Technologie

(Rept-22) Avail: NTIS HC A02/MF A01

An approach to the Riemann problem in which a strictly hyperbolic system of conservation equations is taken into account is outlined. A method to solve the fixed point problem related to the Riemann problem is explained and the case of a cold gas is treated. Author (ESA)

N84-19518# Technische Hochschule, Aachen (West Germany). Fachgebeit Technische Chemie und Petrolchemie.

OLIGOMERIZATION AND BUTENOLYSIS OF OLEFINS BY METATHESIS: CONTRIBUTIONS TO A CHEMICAL USE OF INDUSTRIAL C4-OLEFINS Final Report, Dec. 1981

Siegfried Warwel, Heinz Kirchmeyer, Gerd Hachen, Heinz Ridder, and Albert vandeberg Bonn Bundesministerium fuer Forschung und Technologie Sep. 1983 61 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-83-184; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

Reactions and procedures for the chemical use of butenes, particularity of 2-butene, were examined. Olefin metathesis was used. The desired products are propene and higher molecular unbranched olefins as feedstock for the production of plasticizers and detergents, as well as higher olefins. In the presence of suitable catalysts medium molecular weight a-olefins react with 2-butene (butenolysis) resulting in beta-olefins under chain prolongation and propene as a second product. Long chain diolefins are obtained by butenolysis of industrial cycloolefins (C8, C12). Bifunctional catalysis for metathesis and double-bond isomerization were developed. Using these catalysts medium molecular weight olefins are converted into broad range olefin mixtures (metathetic oligomerization), from which useful fractions can be isolated by distillation. A continuous labor plant was constructed, in which 2-butene is converted into propene and higher olefins on a Re-Pt-contact. Author (ESA)

N84-19519# Fraunhofer-Inst. fuer Angewandte Festkoerperphysik, Freiburg (West Germany).

INVESTIGATION OF ELECTROCHROMIC EFFECTS FOR DISPLAY APPLICATION Final Report, Dec. 1982

Lutz Pickelmann, Peter Schlotter, and Christa Vogel Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 108 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-83-212; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22,50

Structure, stability, and response time of electrochromic tungsten oxide layers are studied for electrochromic display applications. Flash evaporation of tungsten on preheated substrates under high vacuum proved to be feasible. Increased stability, shortened response time of about 200 msec, and improved reproducibility are pointed out. Author (ESA)

N84-19520# Conradty (C.) G.m.b.H. und Co. K.G., Nuernberg (West Germany).
DIMENSIONALLY STABLE ELECTRODE FOR FUSED SALT ELECTROLYSIS (REPLACEMENT OF PETROL COKE) Final report, Dec. 1981
Dieter H. Zoellner Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 51 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-224; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11

A combination electrode for fused salt electrolysis was tested. It consists of an upper water cooled metallic part with a protective coating against heat and corrosion, a middle part made of graphite and surface protected against chemical and electrochemical corrosion, and an active part (tubes and rods) made of tin oxide fiber composites. No significant technical differences between different electrode types is determined during laboratory tests.
Author (ESA)

N84-19521 California Univ., Irvine.
EVALUATION OF A CANDIDATE MODEL COMPLEX FLOW COMBUSTOR USING INSTANTANEOUS TWO-COLOR LASER ANEMOMETRY Ph.D. Thesis
Roger Duane Brum 1983 236 p
Avail: Univ. Microfilms Order No. DA8327916

Continuous combustion systems feature complex (i.e., turbulent and recirculating) flows to promote mixing and flame stabilization. Predictive models are being developed as well as nonintrusive diagnostics to enable analysis of the mass, momentum and energy transport that dictate the performance of such systems. To support these efforts a need exists for a model laboratory scale combustor that features characteristics representative of a practical system (e.g., non-premixed operation, swirl, strong turbulence, and recirculation). An evaluation of candidate geometries for that role was conducted including the development and application of simultaneous two-component laser anemometry and flow visualization diagnostics, and the development and test of a criterion for model complex flow laboratory combustor geometries. The net result was the evolution of a novel design, a dilute swirl combustor (DSC). Dissert. Abstr.

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-19522# Aluminum-Verlag G.m.b.H., Dusseldorf (West Germany).
KEY TO ALUMINIUM ALLOYS. DESIGNATIONS, COMPOSITIONS, TRADE NAMES OF ALUMINIUM MATERIALS, FIRST EDITION
W. Hufnagel Jul. 1982 247 p
(ISBN-3-87017-160-X) Copyright. Avail: Issuing Activity

Identification of unfamiliar designations, quick comparison of alloy designation in international use, trade names and designations, related standard and standard-like designations used in various countries, related designations and compositions of aluminum products for special applications, international standards and standard-like designations and compositions, national standards and specifications for aluminum and aluminum alloys, related trade and standard designations in various countries, temper designations, and international and national standard organizations and technical institutions are discussed. N.W.

N84-19523*# Columbia Univ., New York. Center for Strategic Materials.
THE ROLE OF COBALT ON THE CREEP OF WASPALOY Final Report
Robert N. Jarrett, Lori Chin, and John K. Tien Feb. 1984 35 p refs
(Grant NAG3-57)
(NASA-CR-174628; NAS 1.26:174628) Avail: NTIS HC A03/MF A01 CSCL 11F

Cobalt was systematically replaced with nickel in Waspaloy (which normally contains 13% Co) to determine the effects of cobalt on the creep behavior of this alloy. Effects of cobalt were found to be minimal on tensile strengths and microstructure. The creep resistance and the stress rupture resistance determined in the range from 704 to 760 C (1300 to 1400 C) were found to decrease as cobalt was removed from the standard alloy at all stresses and temperatures. Roughly a ten-fold drop in rupture life and a corresponding increase in minimum creep rate were found under all test conditions. Both the apparent creep activation energy and the matrix contribution to creep resistance were found to increase with cobalt. These creep effects are attributed to cobalt lowering the stacking fault energy of the alloy matrix. The creep resistance loss due to the removal of cobalt is shown to be restored by slightly increasing the gamma' volume fraction. Results are compared to a previous study on Udimet 700, a higher strength, higher gamma' volume fraction alloy with similar phase chemistry, in which cobalt did not affect creep resistance. An explanation for this difference in behavior based on interparticle spacing and cross-slip is presented. Author

N84-19524# Naval Postgraduate School, Monterey, Calif.
EFFECTS OF PREHEAT ON WELDMENTS OF NICOP STEEL M.S. Thesis
Richard F. Burna Sep. 1983 72 p
(AD-A137145) Avail: NTIS HC A04/MF A01 CSCL 11/6

Shielded metal arc weldments of Armco Steel Corporation's NICOP class 3, 19mm (3/4 inch) plate, conforming to ASTM A710 grade A, were studied to provide information concerning the microstructure in the heat affected zone (HAZ) of weldments fabricated with and without preheat. Microhardness, scanning electron microscopy and transmission electron microscopy were used to determine the effect of preheating on the microstructure. Similar microstructures in the preheat and non-preheat samples were observed. The microstructures were polygonal and acicular ferrite in the base and base/HAZ regions and increasing amounts of bainite and auto tempered martensite islands near the fusion line. From the point of view of microstructure, NICOP appears to be weldable without preheating. GRA

N84-19525# Royal Military Coll. of Science, Shrivenham (England). Dept. of Chemistry and Metallurgy.
ALKANE SOLUBLE TRANSITION METAL COMPLEXES Final Report, 15 Apr. 1979 - 6 Oct. 1983
F. R. Hartley Oct. 1983 151 p
(Contract DAJA37-81-C-0594; Grant DA-ERO-79-G-0033)
(AD-A137252; RMCS-TR-D/R/2; SAR-3) Avail: NTIS HC A08/MF A01 CSCL 07/3

A series of tertiary phosphines and tertiary phosphine oxides containing long alkyl chains have been synthesized. As expected they are very soluble in non-polar solvents, particularly hydrocarbons. As a consequence it is difficult to separate these compounds from intermediates and by-products formed during their synthesis. Accordingly it is necessary to purify all the reactants and to use reactions that give a minimum of side products. The same remarks apply to the synthesis of the transition metal complexes of these ligands. The transition metal complexes of the tertiary phosphine ligands have been prepared with rhodium(I), palladium(O), palladium(II), platinum(O) and platinum(II). All are very soluble in non-polar organic solvents. This extreme solubility modifies the catalyticproperties of these complexes in homogeneous solution, as demonstrated by the enhanced ratio of normal: branched aldehyde formed in the hydroformylation of 1-hexene in the presence of (RhCl(CO)L2) when para-alkyl groups are present on the triarylphosphine L. The value of extreme solubility on the catalytic properties of the resulting complexes is particularly well demonstrated by the ability of the platinum(II) complexes (PtL2Cl2) together with tin(II) chloride to promote the partial hydrogenation

of the polyolefins methyl linoleate and methyl linolenate to the corresponding monoolefins wtih high selectivity. GRA

N84-19526# Martin Marietta Corp., Denver, Colo.
EFFECTS OF YTTRIUM MICROALLOYING ON THE EPITAXIAL GRAIN GROWTH IN TI-6AI-4V WELD FUSION ZONES Technical Report, 5 Nov. 1982 - 4 Aug. 1983
Mohan S. Misra Oct. 1983 48 p
(Contract N00014-83-C-0090)
(AD-A137272; MCR-83-655) Avail: NTIS HC A03/MF A01 CSCL 11/6

The fusion zone microstructure in Ti-6Al-4V welds consists of long columnar grains, grown epitaxially from the fusion zone (FZ)/heat affected zone (HAZ) interface. Introducing small amounts (0.01 to 0.1 wt %) of yttrium to the fusion zone by microalloyed filler wire, results in significant grain refinement. However, initial grains still grow epitaxially, suggesting that some time dependent processes are responsible for the observed refinement away from the FZ/HAZ interface. Classical nucleation and growth theories were modified by introducing two competing time concepts; one time to nucleate one grain and the other time for epitaxial grains to grow across the total width of the bead. The theoretical model was verified experimentally by determining the nucleation time and growth rate from the microstructural observation of grain orientation with respect to welding direction and speed. Yttrium microalloying increases the solidification rate and decreases the nucleation time. The later effect is more pronounced and is responsible for the fusion zone grain refinement. GRA

N84-19527# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
QUASI-CLEAVAGE AND MARTENSITE HABIT PLANE Technical Report
Ming Gao (Jiao Tong Univ., Shanghai) and R. P. Wei Sep. 1983 42 p
(Contract N00014-75-C-0543; NR Proj. 036-097)
(AD-A137378; IFSM-83-122; TR-16) Avail: NTIS HC A03/MF A01 CSCL 11/6

Quasi-cleavage (QC) is often observed on the fracture surfaces of hydrogen embrittled iron and steels. For quenched-and-tempered martensitic high strength steels, most QC facets show geometrical markings that are made up of fine oblong elements arrayed at well defined angles. To better understand this mode of failure, scanning and transmission electron microscopy (SEM and TEM) and etch-pit analysis have been applied to the study of quasi-coverage and of martensitic structure in an AISI 4340 steel (tempered at 478 K). A special technique was developed for determining martensite habit planes without the need for concomitant presence of retained austenite or annealing twins in the microstructure. Quasi-cleavage in this AISI 4340 steel has been shown to be cleavage along (110) alpha, planes through martensites, and (225) gamma have been unambiguously determined as the martensite habit planes. The methods of analyses are described. The relationship between surface features of QC facets and the martensitic microstructure and the possible interaction between hydrogen and slip are discussed. Potential application of the analysis method to studies of martensitic transformation is considered. Author (GRA)

N84-19528# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
CRACK PATHS AND HYDROGEN-ASSISTED CRACK GROWTH RESPONSE IN AISI 4340 STEEL Technical Report
Ming Gao (Jaio Tong Univ., Shanghai), M. Lu, and R. P. Wei Sep. 1983 48 p
(Contract N00014-75-C-0543; NR Proj. 036-097)
(AD-A137388; IFSM-83-121; TR-15) Avail: NTIS HC A03/MF A01 CSCL 11/6

A study of the correlation and crack growth response was undertaken to better define the elemental processes involved in gaseous hydrogen embrittlement. AISI 4340 steel fracture under sustained load in hydrogen and in hydrogen sulfide over a range of temperatures and pressures, whose crack growth kinetics have been well characterized previously, was chosen for study. Fractographic results showed that crack growth followed predominantly along prior-austenite grain boundaries, with a small amount of quasi-cleavage, at low temperatures. At high temperatures, crack growth occurred primarily by microvoid coalescence. The fracture surface morphology, which is indicative of the micromechanisms for crack growth, was essentially the same for hydrogen and hydrogen sulfide. Changes in fracture morphology, i.e., crack paths, corresponded to changes in crack growth kinetics, both of which depended on pressure and temperature. There was no evidence for crack nucleation in advance of the main crack, and this suggests that the fracture process zone is located within one prior-austenite grain diameter from the crack tip. GRA

N84-19529# Southwest Research Inst., San Antonio, Tex.
COMPRESSIVE STRENGTH AND DAMAGE MECHANISMS IN PARTIALLY STABILIZED ZIRCONIA Interim Technical Report, 1 Aug. 1982 - 31 Dec. 1983
J. Lankford and R. Sherman Dec. 1983 52 p
(Contract N00014-75-C-0668)
(AD-A137513; AD-E401120; SWRI-06-4231) Avail: NTIS HC A04/MF A01 CSCL 11/6

The flow and fracture behavior of partially (Mg) stabilized zirconia subject to compressive loading was characterized for a wide range of strain rates and temperatures. It was found that the material exhibits plastic flow from 23C to 1200C, and that the flow stress curve is serrated. Contrary to results for Al2O3, SiC, and Si3N4, the strain rate dependence of compressive strength for PSZ does not correlate with the stress intensity dependence of subcritical crack growth velocity. These results, combined with the presence of an unusual type of deformation banding, have been interpreted in terms of plastic strain-induced, co-operative martensitic transformation of metastable precipitates. Additional work has performed as part of an effort to establish the role of grain boundaries and grain boundary chemistry in the deformation and fracture of PSZ. Initial work has involved Auger electron spectroscopy of Ca-stabilized PSZ. It was found that intergranular regions are enriched in silica and calcium, and that grain boundary facets were apparently coated by a thin, continuous second phase film. Author (GRA)

N84-19530# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
EFFECTS OF FATIGUE ON THE G.P. ZONES IN Al-Zn ALLOYS
R. G. Pahl, Jr. and J. B. Cohen 16 Jan. 1984 49 p
(Contract N00014-80-C-0116)
(AD-A137518; AD-E401120; TR-13) Avail: NTIS HC A03/MF A01 CSCL 11/6

Small-angle X-ray scattering has been applied to study the evolution and stability of G.P. zones in two Al-Zn alloys during fatigue, to provide statistically sound information on this process. In a 5.3 at pct Zn alloy containing zones with an average diameter of the normally sluggish coarsening was accelerated by fatigue at room temperature. In the same alloy with larger zones there is no growth, except near a fatigue crack. Reverted samples aged rapidly during fatigue at room temperature, but in a reverted sample of Al-3.5 at pct Zn tested, appreciable zone growth did not occur. Upon warming this sample (without any load) to room temperature, rapid clustering took place. These results imply a vacancy fraction produced during fatigue, and this excess vacancy concentration appears to be the cause of zone growth during room temperature fatigue. GRA

N84-19531# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
SIZE DISTRIBUTION FOR G.P. ZONES IN DILUTE Al-Zn ALLOYS
R. G. Pahl, Jr. and J. B. Cohen 9 Jan. 1984 7 p
(Contract N00014-80-C-0116)
(AD-A137519; AD-E401120; TR-12) Avail: NTIS HC A02/MF A01 CSCL 11/6

The G.P. zone size distribution has been measured in dilute Al-Zn alloys via small-angle X-ray scattering. This distribution does

not agree with current theories for the Ostwald ripening process. Author (GRA)

N84-19532# Naval Ship Research and Development Center, Annapolis, Md. Ship Materials Engineering Dept.
EFFECT OF ELECTROMAGNETIC STIRRING ON WELD POOLS
R. DeNale and W. E. Lukens Oct. 1983 36 p
(Contracts N00014-80-WR-30087; N00014-80-WR-30088; NR Proj. 031-858; RR0220101)
(AD-A136718; DTNSRDC/SME-83/65) Avail: NTIS HC A03/MF A01 CSCL 11/6

Autogenous gas tungsten arc welds were made perpendicular to the rolling direction on a single heat of Ti-6Al-4V alloy. A commercial electromagnetic arc control system producing a transverse magnetic field that enabled the arc to be rotated at frequencies ranging from 0 to 35 Hz. Control welds were made without arc rotation. Two series of welds were made with the rotating arc, one at a welding speed of 1.7 mm/s and the second at a welding speed of 3.4 mm/s. The frequency of arc rotation was varied from 1 to 35 Hz while all other welding variables were maintained constant. Metallographic examination was performed transverse and parallel to the longitudinal axis of the weld to determine the effect of arc rotation on the size of the columnar grains associated with titanium welding, the depth of penetration, and the width of the weld bead. In general, increasing the frequency of arc rotation over the range studied had no effect on the area, major axis or minor axis of the columnar grains for either of the welding speeds employed. For the series which employed a welding speed of 1.7 mm/s the depth of penetration decreased initially and then increased to the depth of the control series. Conversely, the weld bead width increased initially with the introduction of arc rotation. With a welding speed of 3.4 mm/s, arc rotation had a detrimental effect on the weld bead contour. GRA

N84-19533# Illinois Univ., Urbana-Champaign. Dept. of Ceramic Engineering.
ROLE OF AL-2O-3 IN SINTERING OF SUBMICRON YTTRIA-STABILIZED ZRO-2 POWDERS Final Report, Oct. 1980 - 30 Sep. 1983
R. C. Buchanan and D. M. Wilson 2 Dec. 1983 39 p
(Contract N00014-80-K-0969)
(AD-A136798; TR-8) Avail: NTIS HC A03/MF A01 CSCL 11/6

The use of Al2O3 (up to approximately 3.5 wt%) as a sintering aid to promote rapid densification of precipitated yttria (8.0 wt. %) stabilized Zirconia (YSZ) powders in the range 1100 1350 C, was investigated. The A12O3 was added as hydrated Al(OH) and dispersed by milling in a 60 : 40 alcohol : water solution, followed by pressing at 205 MPa. Significantly increased densification was obtained with Al2O3, even below 1200 C, and optimum densification (>99.0% Th.D.) occurred at 1350 C/1 hr. with 0.325 wt% Al2O3. These samples exhibited enhanced electrical conductivity and larger grain size (0.3 - 0.5 micrometer). TEM microstructural observations and densification kinetic data indicated a liquid phase assisted sintering mechanism. Solid state doping of the ZrO2 by Al was inferred from the electrical conductivity data. GRA

N84-19534# Pennsylvania Univ., Philadelphia. Dept. of Materials Science and Engineering.
ANNEALING EFFECTS IN FERROMAGNETIC AMORPHOUS ALLOYS Annual Report, 1 Aug. 1982 - 30 Oct. 1983
C. D. Graham, Jr. and T. Egami 15 Dec. 1983 12 p
(Contract N00014-80-C-0896)
(AD-A136843; AR-3) Avail: NTIS HC A02/MF A01 CSCL 11/6

The kinetics, and therefore probably the atomic mechanism, of the annealing of field induced anisotropy, Curie temperature, and internal friction have been shown to be the same in certain ferromagnetic amorphous alloys. Disaccomodation can be almost eliminated, and permeability increased, by annealing a zero magnetostriction amorphous alloy in a perpendicular field. Flash annealing of amorphous alloys permits new annealing treatments that are not otherwise possible. A model of magnetostriction in amorphous alloys relates to the magnitude and sign of the magnetostriction directly to the magnitude and sign of the screening in a screened point charge model. In particular, the linear magnetostriction is zero if there is no screening. Author (GRA)

N84-19535# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SUSTAINED LOAD CRACK GROWTH IN INCONEL 718 UNDER NON-ISOTHERMAL CONDITIONS M.S. Thesis
D. L. Miller Dec. 1983 80 p
(AD-A136925; AFIT/GAE/AA/83D-15) Avail: NTIS HC A05/MF A01 CSCL 20/11

This investigation found linear cumulative damage modeling applicable to creep crack growth under non-isothermal conditions. The best results are obtained for high crack growth rates produced either by high temperature (above 593C), or by high stress intensities (K greater than 50 MPA square root of m). Except for one test, the linear model predicts conservative growth rates. Constant temperature data are collected for 537, 593, and 648C and presented as da/dt vs K curves. Center-cracked specimens of Inconel 718 are used. The isothermal baseline data are used to predict crack growth rates for the non-isothermal tests using linear cumulative modeling. The predicted creep crack growth rates were within a factor of two of the actual test data. The time-to-failure, predicted for one test, is 56 percent of the actual time to failure. GRA

N84-19536# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EVALUATION OF FATIGUE-CREEP CRACK GROWTH IN AN ENGINE ALLOY M.S. Thesis
J. R. Christoff Dec. 1983 80 p
(AD-A136956; AD-E001638; AFIT/GA/AA/83D-2) Avail: NTIS HC A05/MF A01 CSCL 11/6

This study investigates fatigue-creep interaction effects in alloys and evaluates the effectiveness of predictive models currently in use by the aircraft engine industry. The state-of-the-art crack growth rate prediction models are supplied by the General Electric Company (MSE) model, and the Pratt and Whitney Aircraft Group (SINH) model. They are used to predict crack growth rates under a range of conditions which involve fatigue-creep interactions. Another aspect of this study invoives the development of an empirical model to predict fatigue-creep crack growth based on creep crack growth rate data and knowledge of the loading wave-form. This study is primarily directed toward high temperature (> or = 1000 F) fatigue-creep interaction at low test frequencies and positive stress ratios. The SINH model proves to be more accurate than the MSE model in predicting crack growth rates for the data analyzed. Both models predict linear relationships for the variations of crack growth rates for the MSE model in predicting crack growth rates for the data analyzed. Both models predict linear relationships for the variation of crack growth rates (da/dN) with the length of hold-time or the frequency rate on logarithmic coordinates. GRA

N84-19537# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
CHARACTERIZATIONS OF PREHEATED AND NON-PREHEATED HY-80 STEEL WELDMENTS BY TRANSMISSION ELECTRON MICROSCOPY M.S. Thesis
David Richard Clark Sep. 1983 96 p
(AD-A136966) Avail: NTIS HC A05/MF A01 CSCL 11/6

Preheating HY-80 steel weldments is standard procedure, but it is an expensive and time consuming step in the fabrication of hull structures. The microstructures and hardness profiles of both a preheated (250 F--121 C) and a non-preheated (32 F--0 C) HY-80 steel weldment were studied to provide information and allow comparisons of the microstructural transformations that occur in the heat affected zone during shielded metal arc welding. Optical, scanning electron and transmission electron microscopy were utilized to characterize the microstructure within the heat affected zone of each weldment. The only significant difference observed was that preheating reduced the amount of transformation twinned

martensite found in the weld heat affected zone which may reduce the susceptibility to hydrogen induced cold cracking. Author (GRA)

N84-19538# Michigan State Univ., East Lansing. Dept. of Metallurgy, Mechanics and Material Science.
EFFECT OF TEMPERATURE ON SOME OF THE MECHANICAL PROPERTIES OF Cu-10NI-6Sn SPINODAL ALLOY
A. Vilassakdanont and K. N. Subramanian 1983 22 p refs Presented at TMS-AIME Fall Meeting, Philadelphia, 2 Oct. 1983
(Contract DE-AC02-81ER-10942)
(DE84-004432; DOE/ER-10942/5; CONF-8310205-6) Avail: NTIS HC A02/MF A01

Tensile tests on Cu-10Ni-6Sn spinodal alloy were carried out with polycrystalline samples in as-quenched and aged conditions at various temperatures ranging from 77 K to 353 K. There was no marked difference in activation energy for plastic flow of as-quenched and aged specimens. The work-hardening rate and the total elongation were found to be independent of the amplitude and wavelength of the composition modulation in the spinodally-modulated structure. Performance of the aged specimens was accommodated by coarse slip, whereas the as-quenched specimens deformed by fine slip. DOE

N84-19539# Hanford Engineering Development Lab., Richland, Wash.
THERMAL CREEP AND STRESS-AFFECTED PRECIPITATION OF 20% COLD-WORKED 316 STAINLESS STEEL
R. J. Puigh, A. J. Lovell, and F. A. Garner Aug. 1983 5 p refs Presented at 3rd Topical Meeting on Fusion Reactor Mater., Albuquerque, N. Mex., 19 Sep. 1983
(Contract DE-AC06-76FF-02170)
(DE84-004933; HEDL-SA-2904-FP; CONF-830942-76) Avail: NTIS HC A02/MF A01

Measurements of the thermal creep of 20% cold worked 316 stainless steel were performed for temperatures from 593 to 760 C, stress levels as high as 138 MPa and exposure times as long as 15,000 hours. The creep strains exhibit a complex behavior arising from the combined action of true creep and stress affected precipitation of intermetallic phases. The latter process is suspected to be altered by neutron irradiation. DOE

N84-19540# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
WORKHARDENING CORRELATIONS BASED ON STATE VARIABLES IN SOME FCC METALS IN MONOTONIC LOADINGS
M. A. Korhonen, S. P. Hannula, and C. Y. Li Oct. 1983 47 p refs
(Contract DE-AC02-82ER-12038)
(DE84-004880; DOE/ER-12038/3) Avail: NTIS HC A03/MF A01

A state variable approach of workhardening properties of 316 stainless steel commercial purity aluminum and OFHC copper at room temperature was investigated. A generalized workhardening correlation is formulated by using two state variables only, the structural state parameter and the inelastic strain rate. Particularly, an absolute workhardening coefficient is proposed to be a product of two parts: the athermal part, which is structure dependent only, will be approached at low homologous temperatures and/or high strain rates, while the strain rate sensitive part describes a dynamic recovery contribution at high homologous temperatures and/or low strain rates. Moreover, a single master curve is constructed to display the dependence of workhardening coefficient on structure and strain rate. DOE

N84-19541# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
REPEATED LOAD RELAXATIONS OF TYPE 316 AUSTENITIC STAINLESS STEEL
S. P. Hannula and C. Y. Li Oct. 1983 7 p refs
(Contract DE-AC02-82ER-12038)
(DE84-004875; DOE/ER-12038/9) Avail: NTIS HC A02/MF A01

Results demonstrate that strain aging has a clear effect on the relaxation behavior of 316 SS even at room temperature, the effect being more pronounced at high strains. The phenomena is accounted for according to a state variable model by modifying the rate constant a*, which is affected by the amount of mobile dislocations as well as the dislocation mobility. DOE

N84-19542# California Univ., Berkeley. Lawrence Berkeley Lab. Div. of Materials and Molecular Research.
DESIGN AND CHARACTERIZATION OF Mn-Al-C ALLOYS FOR PERMANENT MAGNET APPLICATIONS Ph.D. Thesis
Jingsheng Gau Oct. 1983 235 p refs
(Contract DE-AC03-76SF-00098)
(DE84-004881; LBL-16897) Avail: NTIS HC A11/MF A01

Extrusion is the most effective means of developing a deformation texture which coincides with the easy axis of magnetization. However, severe deformation induces disordering and possibly a phase change. No Mn3AlC precipitates were found except in the magnet alloyed with Cu. Second phase particles of Al2O3 dispersed in the ferromagnetic phase are identified. Catastrophic intergranular fracture is attributed to the enhancement of oxygen at grain boundaries and their high energetic state where the magnetic domain walls are pinned. The negative effect of Fe as an alloying element is due to its nonmagnetic behavior affecting the local atomic environment. The best properties with (BH)/sub max/ = 8.1 MGOe in the magnet containing 0.8 wt % Ni is attributed to the strong local Ni-Mn ferromagnetic coupling and improved magnetic anisotropy. Rapid solidification processing by melt spinning results in a new nonmagnetic hexagonal ordered phase. The Mn-Al-C magnetic powders having a coercivity of 1640 Oe and a magnetic moment of 55.7 emu/g were not suitable for magnetic recording. DOE

N84-19543# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
PROTECTIVE OXIDE FILMS Progress Report, 1 Apr. - 30 Nov. 1983
Robert K. MacCrone 1983 25 p refs
(Contract DE-AC02-79ER-10428)
(DE84-004088; DOE/ER-10428/5) Avail: NTIS HC A02/MF A01

The formation of metallic inclusions in NiO scales indicates extreme deviations in a system long thought to be ideal. The dependence of this deviation on the oxidizing conditions such as temperature, partial pressure of oxygen, surface preparation, and grain size was investigated. Results show that the departure from ideality is most likely due to nonidealities at the oxide metal interface such as cracks, nonplanar regions, and grain boundaries in the oxide and metal substrate. In case of TiO the defects responsible for the oxidation are detected by EPR. Specimens oxidized at different temperatures and oxygen partial pressures were measured at low temperatures. Metal of two different purities were used, the impurity content being determined by XRFS. Results show that the purity of the base metal plays an important role; impurities may suppress the dependence of the Ti interstitial concentration on oxygen partial pressure. DOE

N84-19544# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
LOAD RELAXATION TESTING AT MEDIUM STRAIN RATES
D. W. Henderson, R. C. Kuo, and C. Y. Li Oct. 1983 26 p refs
(Contract DE-AC02-82ER-12038)
(DE84-004877; DOE/ER-12038/11) Avail: NTIS HC A03/MF A01

The feasibility of a new mechanical testing technique is described. This technique allows the collection of load relaxation type data at higher strain rates than is possible in a conventional load relaxation test. This technique was used in commercial purity aluminum and 304 stainless steel at strain rates up to 5/s. Good agreement with Hart's state variable model for plastic deformation was found. DOE

N84-19545# Brookhaven National Lab., Upton, N. Y.
DETECTION AND PERFORMANCE OF DEFECTS IN ALUMINUM COATED STEELS
Hugh S. Isaacs and R. Jackson (Army Armament Research and Development Command) 1983 9 p refs Presented at the

Electrochem. Soc. Fall Meeting, Washington, D.C., 9 Oct. 1983
(Contract DE-AC02-76CH-00016)
(DE84-004175; BNL-33981; CONF-831086-10) Avail: NTIS HC A02/MF A01

The measured variations in current density resulting from exposed steel and iron containing inclusions were used as a nondestructive method for locating these heterogeneities on aluminum coated steel. The measurements were carried out with a vibrating probe in a borate solution where the dissolution rates of both iron and aluminum are sufficiently low to prevent any damage to the coating or underlying metal. The difference in the anodic and cathodic polarization behavior of predominant inclusions was used to determine the ratio of their relative contributions to the applied current, which provided the information to generate a computerized, three dimensional current density graph that pinpoints these inclusions. DOE

N84-19546# California Univ., Berkeley. Lawrence Berkeley Lab.
MAGNETO-MECHANICAL EFFECTS IN 304 STAINLESS STEELS
B. Fultz, G. M. Chang, R. Kopa, and J. W. Morris, Jr. Aug. 1983 13 p refs Presented at Cryogen. Engr. Conf. and Intern. Cryogen. Mater. Conf., Colorado Springs, 15 Aug. 1983
(Contract DE-AC03-76SF-00098)
(DE84-004343; LBL-16536; CONF-830841-28) Avail: NTIS HC A02/MF A01

From an engineering standpoint, the effects of an 8 T magnetic field on the strength and fatigue crack growth rate of 304L and 304LN stainless steels at 77 K are small. Nevertheless, the work hardening behavior of 304L is consistent with an increased amount of gamma yields alpha prime transformation in the presence of the magnetic field. Both an increase in the amount of prior cold work and an increase in the amount of carbon plus nitrogen in this material causes the transformation to effect more work hardening which does not contribute to the elongation of the material. Preliminary data show that the effect of an 8 T magnetic field on the fatigue crack growth rates of 304L and 304LN at 77 K is barely measurable, but a decrease in the fatigue crack growth rate is suggested. A magnetic field of 8 T is a practical threshold for observing magneto-mechanical effects in 304 stainless steels. If 304 stainless steels are proposed as structural materials for superconducting magnets with higher operating fields, magneto-mechanical effects may become a subject of more engineering concern. DOE

N84-19547# Westinghouse Hanford Co., Richland, Wash.
FRACTURE TOUGHNESS OF FERRITIC ALLOYS IRRADIATED IN HFIR
F. H. Huang Nov. 1983 6 p refs
(Contract DE-AC06-76FF-02170)
(DE84-004594; HEDL-7419) Avail: NTIS HC A02/MF A01

The fracture toughness of HT-9 and 9Cr-1Mo irradiated in HFIR to 10 dpa at 50 C was evaluated using electropotential single specimen techniques. Circular compact tension specimens were tested at temperatures ranging from room temperature to 450 C. The test results were analyzed using the J integral approach. Analyses showed that the fracture toughness of both alloys was reduced as a result of HFIR irradiation. The degradation of irradiation toughness resistance was more severe for 9Cr-1Mo than HT-9. The thickness criterion for valid J/sub 1c/ values was satisfied by the thickness of the test specimens. DOE

N84-19548# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
FINITE ELEMENT ANALYSIS OF METAL FORMING PROCESSES WITH THERMOMECHANICAL COUPLING
A. Chandra and S. Mukherjee Oct. 1983 41 p refs
(Contract DE-AC02-82ER-12038)
(DE84-004879; DOE/ER-12038/12) Avail: NTIS HC A03/MF A01

A finite element analysis is presented for warm forming problems. Thermomechanical coupling is included and an elastic viscoplastic material model is used. This formulation is capable of using any of a class of combined creep plasticity constitutive models with state variables for the description of material behavior. The specific problem considered is plane strain extrusion using the constitutive model originally proposed by Hart. Numerical results are presented for sample problems and the important effects of extrusion speed and friction (at the die workpiece interface) on the residual stresses and temperature fields are investigated. The computer program developed is quite general and is modified to analyze other manufacturing processes like rolling, sheet metal forming, etc., as well. It is also modified to use other similar constitutive models for the description of material behavior. DOE

N84-19549# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science.
APPLICABILITY OF HART'S STATE VARIABLE MODEL TO LARGE STRAIN RATE RANGES
D. W. Henderson, R. C. Kuo, and C. Y. Li Oct. 1983 10 p refs
(Contract DE-AC02-82ER-12038)
(DE84-004878; DOE/ER-12038/10) Avail: NTIS HC A02/MF A01

A comparison is reported of the plastic flow properties of two metals with a state variable model for plastic deformation originally proposed by Hart. Only a qualitative comparison is possible. However, within this limitation, agreement is good over a strain rate range of thirteen orders of magnitude. DOE

N84-19550# California Univ., Berkeley. Lawrence Berkeley Lab.
USE OF PHASE TRANSFORMATIONS IN THE DESIGN OF ALLOY STEEL
J. W. Morris, Jr. Jun. 1983 20 p refs Presented at Intern. Conf. on Phase Transformations in Solids, Crete, Greece, 27 Jun. 1983
(Contract DE-AC03-76SF-00098)
(DE84-003050; LBL-16550; CONF-8306165-1) Avail: NTIS HC A02/MF A01

The use of phase transformations in the design of new alloy steels is described and illustrated. The general method of alloy design is described. Two examples are discussed: the development of new ferritic structural steels for use at cryogenic temperature, and the development of dual phase steels for automotive use. DOE

N84-19551# Bendix Corp., Kansas City, Mo.
TITANIUM FABRICATION Final Report
M. G. Ulitchny Dec. 1983 9 p refs
(Contract DE-AC04-76DP-00613)
(DE84-004374; BDX-613-3009) Avail: NTIS HC A02/MF A01

Efficient methods of fabricating large structural components made from various titanium alloys were evaluated. The areas included resistance spot welding of Ti-6Al-4V; thermal mechanical forming and bonding and electrical discharge machining; and tool life studies of C-2 grade carbide inserts which were applicable to all machined parts. Results of some of these studies are applied to the parts for which they were originally developed and to others. DOE

N84-19552# Southwest Research Inst., San Antonio, Tex.
THE STUDY AND MODELING OF HIGH TEMPERATURE FATIGUE CRACK PROPAGATION IN AUSTENITIC STAINLESS STEEL Final Report, 1 Sep. 1979 - 30 Nov. 1983
D. L. Davidson 30 Nov. 1983 73 p refs
(Contract DE-AS05-79ER-10475)
(DE84-005391; DOE/ER-10475/T2) Avail: NTIS HC A04/MF A01

Fatigue crack tip strain and opening displacements were measured for cracks grown in AISI Type 304 stainless steel at room temperature and at 6000 C in both vacuum and air. A special cyclic loading stage for the scanning electron microscope was used to dynamically observe crack growth at room temperature, and crack growth was found to be intermittent. A similar growth pattern was inferred for crack growth at 6000 C from crack growth rate data. Striation spacing measurements were in all cases, greater than average crack growth rate measurements, also indicating

intermittent growth. The crack tip measurements are combined with the dynamic observations in a crack tip failure model and a crack tip geometric model to help explain how fatigue cracks grow, and that the effects of temperature and environment are on this process. DOE

N84-19553# Sandia Labs., Albuquerque, N. Mex.
X-RAY LINE BROADENING STUDIES ON ALUMINUM NITRIDE, TITANIUM CARBIDE AND TITANIUM DIBORIDE MODIFIED BY HIGH PRESSURE SHOCK LOADING
B. Morosin and R. A. Graham 1983 8 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 14 Nov. 1983
(Contract DE-AC04-76DP-00789)
(DE84-003257; CONF-831174-32) Avail: NTIS HC A02/MF A01

Powders of AlN, TiC and TiB2 were subjected to controlled shock loading with peak pressures in the samples between 14 to 27 GPa and preserved for post shock study. Broadened X-ray diffraction peak profiles are analyzed by a simplified method and show increases in residual lattice strain and small decreases in crystallite size. Strain values range from 0.00001 to 0.0001 for TiB2 and to values larger than 0.001 for TiC and AlN. DOE

N84-19554# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Werkstofftechnologie.
EFFECT OF SPECIMEN GEOMETRY ON STABLE CRACK GROWTH BY NONLINEAR MATERIAL BEHAVIOR Thesis - Ruhr University [GEOMETRIEEINFLUSS AUF DAS STABILE RISWACHSTUM BEI NICHTLINEAREM WERKSTOFFVERHALTEN]
D. Hellmann 1983 145 p refs In GERMAN; ENGLISH summary Sponsored by Deuschten Forschungsgemeinschaft
(GKSS-83/E/38; ISSN-0344-9629) Avail: NTIS HC A07/MF A01

The J integral crack resistance (R) curves and crack opening displacement (delta 5) - R curves were measured on compact, three point bend and center-cracked tension specimens. Aluminum alloy 2024-T351 in three conditions, and alloy steel 35NiCr-Mo16 were studied. Effect on stable crack growth was investigated by varying the specimen width, the precrack length and the specimen thickness. It is found that under plane stress conditions the J integral and delta 5 concept correlate more crack growth in the center-cracked tension specimens than in the compact and bend specimens. The delta 5-R curve is more universal than the J-R curve. Author (ESA)

N84-19555# Hoesch Huettenwerke A.G., Dortmund (West Germany). Forschung und Qualitaetskontrolle.
DEVELOPMENT, PRODUCTION AND MARKETING OF A TEMPORARILY PROTECTED BLACKPLATE (TPP) Final Report, Jul. 1982
Ulrich Tenhaven Bonn Bundesministerium fuer Forschung und Technologie Sep. 1983 34 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-195; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7

A blackplate which is temporarily protected against corrosion during storage, delivery, and processing was produced. It can be lacquered and printed with commercially available lacquer and printing inks used for tinplate, without prior removal of the protective film. The product can be welded by standard welding processes without any pretreatment, and is, after lacquering, suitable for packaging of dry goods, mineral oil or similar technical products. The protective film is safe physiologically. About 5000 metric tons of TPP were processed to lacquered and welded packages without any difficulty. Author (ESA)

N84-19556# National Aerospace Lab., Amsterdam (Netherlands). Construction and Materials Div.
FATIGUE AND FRACTURE TOUGHNESS IN ALUMINUM
R. J. H. Wanhill Dec. 1982 36 p In DUTCH; ENGLISH summary Presented at Metaalkungid Genootshap van het Technol. Inst. Course on Efficient Choice of Mater., Antwerpen, Netherlands, 1982-1983
(NLR-MP-82058-U) Avail: NTIS HC A03/MF A01

Technical aluminum alloy fatigue limits and strengths are reviewed. Effect of average and residual stresses; effect of notches; effect of the surroundings are discussed. Influence of surface roughness on crack initiation and plastic deformation of the surface layer are treated. Crack propagation velocity curves, and crack growth threshold values are considered. Fracture toughness is treated. Author (ESA)

N84-19557# Deutsche Gold- und Silber-Scheideanstalt, Frankfurt am Main (West Germany). Fachbereich Forschung Metall.
DEVELOPMENT OF CONTACT MATERIALS BASED ON Ag MADE BY POWDER METALLURGY Final Report, Sep. 1980
Wolfgang Boehm Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 97 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-248; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20,50

An erosion resistant contact material needing less silver than Ag/CdO by application of a smaller contact size was developed. Metal oxides which influence the melting and decomposition behavior under arcing were added to Ag/CdO. No improvement of the erosion resistance is achieved. With Ag/SnO2, however, the improvement of welding resistance and contact resistance results in a material with a low erosion rate which needs less Ag while the switching properties are similar to those of Ag/CdO. Author (ESA)

N84-19558# Krupp (Fried.) G.m.b.H., Essen (West Germany). Abt. Magnetwerkstoffe.
DEVELOPMENT OF LOW COST AMORPHOUS MATERIALS WITH HIGH SATURATION FLUX DENSITY Final Report, Dec. 1981
Wolfgang Jaschinski, Udo Koenig, and Wilhelm Wolf Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 92 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-213; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19,50

Amorphous Fe Si B alloys are considered. Dynamical parameters for the manufacture of narrow and broad strips were investigated. A copper cylinder with a water cooling system proved to be suitable, but for long term operation a molybdenum laminated copper cylinder or a molybdenum alloy cylinder is recommended due to metal melting problems. By systematically varying alloy composition and by suitable heat treatment, high saturation flux densities of approximately 1.5 T and very low losses even at high frequencies are obtained. Results show maximum permeabilities $>$300,000 at 50 Hz and initial permeabilities $>$16,000. Author (ESA)

N84-19559# Technische Univ., Clausthal-Zellerfeld (West Germany). Inst. fuer Metallkunde und Metallphysik.
DEVELOPMENT OF THE TEXTURE AND PLASTIC ANISOTROPY IN STEELS UPON HOT ROLLING, TRANSFORMATION AND COLD ROLLING Final Report, Dec. 1981
Hans-Joachim Bunge and Philip Ian Welch Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 50 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-219; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,50

Interrelationship between plastic anisotropy of steels and their texture is examined. The influence of texture on the yield locus and r-value was quantitatively derived and compared with experimental data. Differences between theory and experiment are observed in fine-grained steels. Measurements were performed

by X ray and neutron diffraction; the latter proves to be the most satisfactory. Theoretical bases of orientation distribution functions (zero range method), the theory of texture inheritance in the gamma to alpha transformation (influence of variance selection) and the theory of texture development (flow field) were developed. The crystallographic transformation law depends relatively little on technological parameters, while variance selection is strongly dependent on those parameters. Author (ESA)

N84-19560# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
RAPID SOLIDIFICATION PROCESSING OF Al-Cu-Li-Mg ALLOYS
B. vanderBrandt, P. J. vanderBrink, H. F. deJong, L. Katgerman, and H. Kleinjan Mar. 1983 15 p refs Sponsored by BIRA Industrial Aluminum Research Foundation
(VTH-LR-380) Avail: NTIS HC A02/MF A01

Aluminum alloys containing up to 3 weight percent lithium and additions of copper and magnesium were rapidly solidified by melt spinning. Their composition was derived from a ternary Al-Cu-Mg reference alloy comparable with 2024, and was obtained by increasing the lithium content and decreasing the copper content. A modified melt spinning technique in which the ribbons are cut into pieces immediately, whereafter the pieces are hot extruded without previous cold compaction and handling of the particulate in vacuum or inert gas was used. A modified heat treatment based on the assumption that the precipitation sequence in Al-Cu-Li-Mg alloys consists of independent precipitation of delta' (Al-Li) and S' (Al-Cu-Mg) was designed. Existence of these independent precipitation sequences is confirmed by transmission electron microscopy; interaction between these precipitation reactions is observed by differential scanning calorimetry. Author (ESA)

N84-19561# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
FATIGUE CRACK GROWTH IN ALUMINUM ALLOY SHEET MATERIAL UNDER CONSTANT AMPLITUDE AND SIMPLIFIED FLIGHT SIMULATION LOADING
Hiroshi Misawa (Metropolitan Univ., Tokyo) and J. Schijve Feb. 1983 41 p refs
(VTH-LR-381) Avail: NTIS HC A03/MF A01

Crack propagation tests were carried out on 2024-T3 aluminum alloy specimens. Flight simulation tests were carried out with constant gust cycles, and with a single overload at either the beginning or the end of each flight. Test variables were the number of gust cycles per flight and the stress level of the overload and the ground load. Crack growth interaction effects (retardations and accelerations) which might support crack growth prediction techniques were studied. Results include observations on the fracture surface transition from tensile mode to shear mode cracking. Crack growth rates strongly depend on stress ratio.
Author (ESA)

N84-19562# Battelle Memorial Inst., Richland, Wash.
EFFECT OF LIQUID TIN-ZINC ON THE DRILLING PARAMETERS OF SEVERAL ALLOYS
R. H. Jones Aug. 1983 49 p
(Grant NSF MEA-82-07140)
(PB84-134782; NSF/MEA-83013) Avail: NTIS HC A03/MF A01 CSCL 13I

The effect of liquid tin zinc on the drilling parameters of 304SS, Inconel 718, 4340 steel, M2 high speed steel, Ti-6Al-4V, and a free machining brass was evaluated and compared to the drilling parameters in air at 25 C and 220 C and in a cutting oil. A constant load drilling test was used and the penetration rate, torque and specific energy were determined for each material-environment combination. The following effects of drilling tin-zinc were observed: (1) under constant load drilling, the penetration rates increased in tin-zinc, relative to other environments; (2) using penetration versus load data, the load needed to achieve a given penetration rate decreased in tin-zinc; (3) the specific energy for drilling was less in tin-zinc than in air or oil for 304SS but not for the other materials; (4) the fracture toughness of the materials was unaffected by drilling in tin-zinc; and (5) tin-zinc was found to reduce the extent of shear band formation and tearing at the edge of the chips. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-19563*# National Aeronautics and Space Administration, Washington, D. C.
PROPERTIES OF CARBON FIBERS WITH VARIOUS COATINGS
Volker Seegel and Paul McMahon Jul. 1983 22 p refs Transl. into ENGLISH of conf. paper presented at the Symp. usber Kohlefaserverstaerkte Polymide (West Germany), 1981 22 p Symp. held in Stuttgart, 28 Apr. 1982 Original language document was announced as A82-37948 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77027; NAS 1.15:77027) Avail: NTIS HC A02/MF A01 CSCL 11G

It is shown that all high modulus carbon fibers are durable with respect to thermal oxidation in air. Among the more widely used and economical materials with low modulus, Celion displays particularly good oxidative durability at high temperatures. This contrast to other materials is due to the low content of Natrium and Kalium in Celion carbon fibers. It is also noted that improved characteristics are attained in Celion carbon fiber/polyimide systems when fibers are used with high temperature resistant polyimide coatings. C.D. (IAA)

N84-19564*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ULTRA-HIGH MOLECULAR WEIGHT SILPHENYLENE-SILOXANE POLYMERS
W. J. Patterson, N. H. Hundley, and L. M. Ludwick Mar. 1984 19 p refs
(NASA-TP-2295; NAS 1.60:2295) Avail: NTIS HC A02/MF A01 CSCL 11B

Silphenylene-siloxane copolymers with molecular weights above one million were prepared using a two stage polymerization technique. The technique was successfully scaled up to produce 50 grams of this high polymer in a single run. The reactive monomer approach was also investigated using the following aminosilanes: bis(dimethylamino)dimethylsilane,N,N-bis(pyrrolidinyl)diethylsilane and N,N-bis(gamma-butyrolactam)dimethylsilane). Thermal analyses were performed in both air and nitrogen. The experimental polymers decomposed at 540 to 562 C, as opposed to 408 to 426 C for commercial silicones. Differential scanning calorimetry showed a glass transition (Tg) at -50 to -55 C for the silphenylenesiloxane copolymer while the commercial silicones had Tg's at -96 to -112 C. Author

N84-19565*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REPEATABILITY OF MIXED-MODE ADHESIVE DEBONDING
R. A. Everett, Jr. and W. S. Johnson Feb. 1984 27 p refs Presented at the ASTM Symp. on Delamination and Debonding of Mater., Pittsburgh, 8-10 Nov. 1983 Prepared in cooperation with Army Research and Technology Labs., Hampton, Va.
(DA Proj. 1L1-61102-AH-45)
(NASA-TM-85753; NAS 1.15:85753; USAAVSCOM-TR-84-B-1) Avail: NTIS HC A03/MF A01 CSCL 11A

The repeatability of debond growth rates in adhesively bonded subjected to constant-amplitude cyclic loading was studied. Debond growth rates were compared from two sets of cracked-lap-shear specimens that were fabricated by two different manufacturers and tested in different laboratories. The fabrication method and testing procedures were identical for both sets of specimens. The

specimens consisted of aluminum adherends bonded with FM-73 adhesive. Critical values of strain-energy-release rate were also determined from specimens that were monotonically loaded to failure. The test results showed that the debond growth rates for the two sets of specimens were within a scatter band which is similar to that observed in fatigue crack growth in metals. Cyclic debonding occurred at strain-energy-release rates that were more than an order of magnitude less than the critical strain-energy-release rate in static tests. Author

N84-19566*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CERAMIC WEAR IN INDENTATION AND SLIDING
Kazuhisa Miyoshi and Donald H. Buckley 1984 24 p refs Proposed for presentation at the 39th Ann. Meeting of the Am. Soc. of Lubrication Engr., Chicago, 7-10 May 1984
(NASA-TM-83585; E-1884; NAS 1.15:83585) Avail: NTIS HC A02/MF A01 CSCL 11B

The various wear mechanisms involved with single-crystal ceramic materials in indentation and in sliding contacts. Experiments simulating interfacial events have been conducted with hemispherical, conical and pyramidal indenters (riders). With spherical riders, under either abrasive or adhesive conditions, two types of fracture pits have been observed. First, spherical-shaped fracture pits and wear particles are found as a result of either indenting or sliding. These are shown to be due to a spherical-shaped fracture along the circular or spherical stress trajectories. Second, polyhedral fracture pits and debris, produced by anisotropic fracture, and also found both during indenting and sliding. These are primarily controlled by surface and subsurface cracking along cleavage planes. Several quantitative results have also been obtained from this work. For example, using a pyramidal diamond, crack length of Mn-Zn ferrite in the indentation process grows linearly with increasing normal load. Moreover, the critical load to fracture both in indentation and sliding is essentially isotropic and is found to be directly proportional to the indenter radius. Author

N84-19567*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DURABLE SOLID LUBRICANT COATINGS FOR FOIL GAS BEARINGS TO 315 DEG C
Robert C. Wagner (Case Western Reserve Univ.) and Harold E. Sliney 1984 14 p refs Proposed for presentation at the 3rd Intern. Conf. on Solid Lubrication, Denver, 5-9 Aug. 1984; sponsored by Am. Soc. of Lubrication Engr.
(NASA-TM-83596; E-1904; NAS 1.15:83596) Avail: NTIS HC A02/MF A01 CSCL 11H

The durability and friction characteristics of bonded solid lubricant films on compliant gas bearings were measured. Coating compositions, which were judged to be suitable for use to at least 315 C, were selected for this study. Most of the data were obtained with polyimide-bonded graphite fluoride coatings and with silicate-bonded graphite coatings. These coatings were applied to the bore of Inconel 750 foil bearings. The journals were A286 stainless steel, with a rms surface finish of 0.2 microns. The foils were subjected to repeated start/stop cycles under a 14 kPa (2 psi) bearing unit load. Sliding contact occurred during lift-off and coast down at surface velocities less than 6 m/s (3000 rpm). Testing continued until 9000 cycles were accumulated or until a rise in starting torque indicated that the coating had failed. The coatings were evaluated in the temperature range from 25 C to 315 C. Comparisons in coating performance as well as discussions of their properties and methods of application are given. Author

N84-19568*# Bowie State Coll., Md.
CHARACTERIZATION OF PHYSIO-CHEMICAL PROPERTIES OF POLYMERIC AND ELECTROCHEMICAL MATERIALS FOR AEROSPACE FLIGHT Annual Report
Michael Rock, Vasanth Kunigahalli, Sher Khan, and Angelie McNair 22 Mar. 1984 39 p refs
(Grant NsG-5009)
(NASA-CR-175406; NAS 1.26:175406) Avail: NTIS HC A03/MF A01 CSCL 11G

Sealed nickel cadmium cells having undergone a large number of cycles were discharged using the Hg/HgO reference electrode. The negative electrode exhibited the second plateau. SEM of negative plates of such cells show clusters of large crystals of cadmium hydroxide. These large crystals on the negative plates disappear after continuous overcharging in flooded cells. Atomic Absorption Spectroscopy and standard wet chemical methods are being used to determine the cell materials viz: nickel, cadmium, cobalt, potassum and carbonate. The anodes and cathodes are analyzed after careful examination and the condition of the separator material is evaluated. Author

N84-19569*# National Aeronautics and Space Administration, Washington, D. C.
STANDARDIZATION AND SELECTION OF A METHOD FOR EVALUATING SHEAR RESISTANCE OF LUBRICATING OILS WITH POLYMER ADDITIVES
Bogdan Wisiicki Jan. 1984 21 p refs Transl. into ENGLISH from Nafta (Katowice, Poland), v. 28, no. 11, 1972 p 515-523 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Inst. of Aeronautics, Poland
(Contract NASw-3541)
(NASA-TM-77383; NAS 1.15:77383) Avail: NTIS HC A02/MF A01 CSCL 11H

The wide use of polymer additives increasing the viscosity index of mineral oils justified the usefulness of selecting a standard laboratory method for evaluating the shear resistance of this kind of oils. The suitability of a particular method was analyzed on the basis of comparative tests performed in Poland and abroad using mechanical methods (in a laboratory and on stands), operational tests, and ultrasonic methods, including the method developed in the Institute of Aeronautics. The ultrasonic method described and incorporated in branch standard BN-70/0535 was accepted as the most advantageous method from the standpoint of standardization requirements. Author

N84-19570# Columbia Univ., New York. Dept. of Chemistry.
POLYMERIZATION OF FUNCTIONALIZED ACETYLENES Technical Report, 22 Jun. 1982 - 9 Dec. 1983
Thoi Huu Ho and Thomas J. Katz 9 Dec. 1983 19 p Submitted for publication
(Contract N00014-79-C-0683)
(AD-A137120; TR-6) Avail: NTIS HC A02/MF A01 CSCL 07/4

The initiator that has most frequently been used to metathesize functionalized olefins—WCl6 + (CH3)4Sn—is an effective initiator for the polymerizations of acetylenes substituted by cyano, ester, and halogen groups. Various initiators effective for acetylenic hydrocarbons fail with these funtionalized derivatives.
Author (GRA)

N84-19571# Johns Hopkins Univ., Baltimore, Md.
QUANTUM CHEMICAL INVESTIGATIONS OF THE MECHANISM OF CATIONIC POLYMERIZATION AND THEORETICAL PREDICTION OF CRYSTAL DENSITIES AND DECOMPOSITION PATHWAYS OF ENERGETIC MOLECULES Annual Summary Report, 1 Oct. 1982 - 30 Sep. 1983
Joyce J. Kaufman 28 Oct. 1983 64 p
(Contract N00014-80-C-0003; NR Proj. 093-064)
(AD-A137271; TR-4; ASR-4) Avail: NTIS HC A04/MF A01 CSCL 20/10

This study involves: Ab-initio crystal orbitals and polymer orbitals; Ab-initio coupled cluster program; Ab-initio quantum chemical calculations and electrostatic molecular potential contour maps for cationic polymerization; Prediction of crystal density; Ab-initio calculations on polynitropolyhedranes and polynitropolyazapolyhedranes; Ab-initio configuration interaction calculations on the CH3-NO2 decomposition pathway of nitromethane; Ab-initio configuration interaction calculations on RDX; and Conversion of our programs to vector supercomputers, CYBER 205 and CRAY.
GRA

N84-19572# California Univ., Berkeley. Dept. of Materials Science and Mineral Engineering.

MICRO AND MACRO MECHANICS OF FRACTURE IN CERAMICS Annual Report, 1 Jan. - 31 Dec. 1983
A. G. Evans, E. D. Case, T. P. Dabbs, M. D. Drory, K. T. Faber, Y. Fu, B. R. Lawn, R. L. Loh, D. B. Marshall, and D. Johnson Walls 15 Nov. 1983 164 p
(Contract N00014-81-K-0362)
(AD-A137290) Avail: NTIS HC A08/MF A01 CSCL 11/2

Research has been conducted on toughening mechanisms, machining and surface damage, thermal shock and general aspects of fracture in ceramic materials. Quantitative models of the various fracture processes have been developed. Special emphasis has been placed on the toughening that occurs in the presence of microcracks. Author (GRA)

N84-19573# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
A DIELECTRIC STUDY OF THE TIME-TEMPERATURE-TRANSFORMATION (TTT) DIAGRAM OF DGEBA EPOXY RESINS CURED WITH DDS (DIAMINODIPHENYLSULFONE) Technical Report, Jun. - Dec. 1983
Norman F. Sheppard, Jr., Michael C. Coln, and Stephen D. Senturia 14 Dec. 1983 14 p To be presented at the SAMPF Meeting, Reno, Nev., Apr. 1984
(Contract N00014-78-C-0591; Grant NSF DMR-81-19295; NR Proj. 356-691)
(AD-A137358; AD-F050087; TR-7) Avail: NTIS HC A02/MF A01 CSCL 11/9

Microdielectrometry and differential scanning calorimetry have been used to study the isothermal cure of EPON 825 with diaminodiphenylsulfone (DDS). The results are compared with published torsional braid analysis (TBA) studies of the same system using a time-temperature-transformation diagram. The dielectric measurements were made at temperatures between 100 and 220 C using measurement frequencies between 0.1 Hz and 10,000 Hz. The DSC was operated in an isothermal mode to determine extent of conversion at temperatures between 137 and 177 C. Two mechanics of charge transport are responsible for the observed dielectric response; an ionic conductivity early in cure that decreases as the reaction proceeds, and a Debye-type dipole relaxation later in cure. The time to reach 60% conversion determined by DSC correlates with the TBA gelation loss peak, as would be expected from the Flory theory of gelation, but there is no clear dielectric event at 60% conversion. The peak in dielectric loss factor identified with the dipole relaxation correlates with the TBA vitrification loss peak. Author (GRA)

N84-19574# Defence Research Establishment, Ottawa. (Ontario). Environmental Protection Section.
COMPARISON OF SEAM TYPES Technical Note
Rita M. Crow and M. Malcolm Dewar Sep. 1983 23 p
(AD-A137383; DREO-TN-83-21) Avail: NTIS HC A02/MF A01 CSCL 11/5

This study compares alternatives seams with the double-lapped seam made in typical Canadian Forces fabrics in order to determine if a seam, other than the double-lapped seam, would be equally serviceable. An acceptable level of seam efficiency had been arbitrarily set at 80% by researchers in the fifties, and was used here. The double-lapped seam attained at least this level in all three fabrics used. Only one of the four alternative seam types evaluated in only one of the fabrics used reached this level. It was recommended that the criterion of 80% seam efficiency be revalidated because of the progress made since the fifties in the technology of sewing threads, seams and fabrics to make them all stronger and more durable. GRA

N84-19575# Defence Research Establishment, Ottawa. (Ontario). Environmental Protection Section.
AN EVALUATION OF A HYDROPHOBIC SILICA PIGMENT USED AS A WATER-REPELLENT FINISH Technical Note
Patricia A. Dolhan and Brian Farnworth Sep. 1983 16 p
(AD-A137389; DREO-TN-83-20) Avail: NTIS HC A02/MF A01 CSCL 11/3

A 100% goosedown sample, treated with a hydrophobic silica pigment water-repellent finish was compared to an untreated 100% goosedown sample to determine the effect of the treatment on the amount of water absorbed by the down, and the properties of the down when wet. The silica pigment markedly reduces the amount of water absorbed by the down, thus reducing its heat loss when wet. The finish remains effective after laundering, and there appear to be no changes in the mechanical properties of the down due to the finish. The effectiveness of the finish was further assessed when treated and untreated wool/nylon socks were tested for amount of water absorbed. The untreated socks absorbed appreciably more water than did the treated socks. GRA

N84-19576# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
INTERCALATION COMPOUNDS: A NEW CLASS OF MATERIALS AS ADVANCED SOLID LUBRICANTS (WEAR LIFE STUDIES AND DIFFERENTIAL THERMAL ANALYSIS) Progress Report
Alfreo A. Conte, Jr. 8 Jan. 1983 48 p
(NR Proj. Z02208)
(AD-A137424; NADC-83066-60) Avail: NTIS HC A03/MF A01 CSCL 11/8

Using graphite as a model host compound the process of intercalation, i.e., the insertion of foreign atoms or molecules between molecular planes of layer-structured solids has been shown to provide new material-with intrinsic lubricating properties substantially more beneficial than those currently available. A synergistic lubricating effect has been uncovered between intercalated metal chloride/graphite species and the non-intercalated metal chloride. A greater than seven-fold increase in endurance life compared to ordinary graphite has been demonstrated for CoCl2 intercalation compounds using the Falex lubricant tester. Pure intercalation compounds of CoCl2 and FeCl3, i.e., free of nonintercalated metal chloride exhibited a 2.5 fold increase in endurance life. Thermal analyses have shown that these compounds are stable to 325 deg C in an inert atmosphere. A mechanism has been proposed to explain the lubricating action based on a gradual decomposition of intercalation compounds at metal-to-metal contact junctions where hot spots can reach temperatures as high as deg 1000 C. The intercalated species which comes out of the graphite crystal then reacts with the metal to form a low shear strength solid which prevents further metal-to-metal contact and thus minimizes wear. Author (GRA)

N84-19577# National Bureau of Standards, Washington, D.C. Polymer Science and Standards Div.
HYSTERESIS IN COPOLYMERS OF VINYLIDENE FLUORIDE AND TRIFLUOROETHYLENE
G. T. Davis, M. G. Broadhurst, A. J. Lovinger, and T. Furukawa Jan. 1984 33 p
(Contract N00014-83-F-0013)
(AD-A137446; TR-22) Avail: NTIS HC A03/MF A01 CSCL 11/9

Copolymers of vinylidene fluoride (VDF) and trifluoroethylene (TrFE), with more than 50 mole percent VDF exhibit D-E hysteresis loops at room temperature which are much sharper than those exhibited by various crystal phases of the PVDF homopolymer. For the copolymer samples investigated here, appreciable conductivity develops at elevated temperatures which in the presence of electric fields leads to trapped charges in the polymer film, These charges then prevent the switching of dipoles at values of electric field that were applied. The room temperature hysteresis is greatly reduced and polarization through the thickness of the film is highly non-uniform. Upon heating the copolymers above the ferroelectric to paraelectric transition temperature, the polarization is destroyed, the space charges are apparently released and room temperature hysteresis is restored. Experiments with aluminum and gold electrodes and with mica blocking electrode lead to the conclusion that the charges are generated internally and are not injected from the electrodes. GRA

N84-19578# Akron Univ., Ohio. Inst. of Polymer Science.
DURABILITY OF ADHESIVE BONDS BETWEEN GLASS OR METAL SUBSTRATES AND A POLYBUTADIENE-

POLYURETHANE
F. Liang and P. Dreyfuss Feb. 1984 38 p
(Contract N00014-76-C-0408)
(AD-A137489; TR-31) Avail: NTIS HC A03/MF A01 CSCL 13/8

The durability of polybutadiene-polyurethane joints or glass or metals in water at room and elevated temperatures was studied. The effects of silane pretreatment of the surface and of surface morphology on adhesion were examined. The durability of the joint was related to the number of chemical bonds that could form between the polyurethane and the surface and to the type of surface treatment given to the surface. Proper treatment led to significant enhancement of durability of the joints. The polyurethane was prepared from ARCO's hydroxyterminated polybutadiene (R-45HT), toluene diisocyanate, trimethylolpropane, and N,N-bis(2-hydroxypropy)aniline. Author (GRA)

N84-19579# Defence Research Establishment, Ottawa. (Ontario). Protective Sciences Div.
FLUOROALKYL SILOXANES AS LIQUID-REPELLENT FABRIC FINISHES. PART 3: THE DURABILITY OF THE COPOLYMERS AND COMPARISONS WITH COMMERCIALLY AVAILABLE FINISHES
John W. Bovenkamp and Benoit V. Lacroix Sep. 1983 23 p
(AD-A136662; DREO-TN-83-4) Avail: NTIS HC A02/MF A01 CSCL 11/3

In this report the durability of liquid repellency properties imparted to fabrics by solutions of the copolymers of fluoroalkyl-substituted silanes and non-fluorinated silanes is examined. The best available commercial finishes were examined at the same time and the results compared with those of the experimental finishes. The durability testing encompassed wear, washing, dry cleaning, and weathering. Although the siloxane copolymers wear well, they are somewhat inferior to the commercial finishes after a number of washes. Much better durability to washing was obtained when a small amount of resin was added to the finish, following the normal commercial practice. The properties found for the siloxane finishes indicate that they could be useful in some circumstances. GRA

N84-19580# Battelle Columbus Labs., Ohio. Macromolecular Science and Technology Sect.
IMPROVED PAINT REMOVAL TECHNIQUE Final Report
James F. Mank, Richard J. Dick, Herbert C. Abrams, and Louis J. Nowacki 25 Apr. 1978 151 p
(Contract F09603-77-A-0708)
(AD-A136671) Avail: NTIS HC A08/MF A01 CSCL 11/3

The project was initiated with a brief visit to Robins Air Force Base to review their aircraft paint stripping operation. After that project initiation visit, Battelle contacted commercial airlines, aircraft manufacturers, military bases, contract stripping companies, and stripping chemical manufacturers to determine what the state-of-the-art is in the field of stripping paint from aircraft. Many personal visits to stripping facilities were made to get first-hand information from the people involved with stripping aircraft and to see the actual stripping facility. A summary of the information obtained from these contacts is provided in the appendix of this report. The complete stripping of a C141 at Robins Air Force Base and the partial stripping of a KC-135 at Tinker Air Force Base were observed. The intent was to identify specific items and practices in the Warner Robins ALC operation that could be improved in order to decrease the amount of time required to strip an aircraft and therefore increase throughput. It was concluded that Warner Robins is essentially up with the state-of-the-art of airplane paint stripping that has been observed at other stripping facilities. GRA

N84-19581# National Bureau of Standards, Washington, D.C. Inorganic Materials Div.
STRESS CORROSION OF CERAMIC MATERIALS Annual Report, 1 Oct. 1982 - 30 Sep. 1983
S. W. Freiman, B. R. Lawn, G. S. White, A. C. Gonzalez, R. F. Cook, P. Chantikul, H. Richter, E. R. Fuller, Jr., S. M. Wiederhorn, and T. A. Michalske 1 Nov. 1983 150 p
(Contract N00014-79-F-0030; NBS Proj. 5610454)
(AD-A136729) Avail: NTIS HC A07/MF A01 CSCL 11/2

The molecular model for crack growth in SiO2 has been extended to other materials. An electrostatic model for crack growth has been developed to explain high velocity behavior in silicate glasses. Effects of internal stresses in ferroelectric barium titanate have been demonstrated. Indentation fracture studies have been initiated on multilayer capacitors in order to correlate crack-like defects with electrical failures. GRA

N84-19582# Virginia Polytechnic Inst. and State Univ., Blacksburg. Polymer Materials and Interfaces Lab.
SILOXANE MODIFIERS FOR EPOXY RESINS
E. M. Yorkgitis, C. Tran, N. S. Eiss, Jr., T. Y. Hu, and I. Yilgor 1 Dec. 1983 56 p
(Contract N00014-78-C-0629)
(AD-A136782; TR-6) Avail: NTIS HC A04/MF A01 CSCL 11/9

Functionally terminated polydimethylsiloxane and its statistical copolymers with either methyltrifluoropropyl (TFP) or diphenyl siloxane have been used to chemically modify bisphenol A-based epoxy resins. Increasing the percentage of TFP or diphenyl units relative to the dimethyl siloxane content of the oligomers enhanced their compatibility with the epoxy resin. This in turn produced smaller rubber particle sizes and altered particle morphology. Improved fracture toughness relative to the cycloaliphatic diamine-cured control resin was achieved in resins modified with polysiloxane copolymers containing 40% or more TFP content or 20% diphenyl siloxane. Comparisons in these and other aspects are made with similarly prepared ATBN- and CTBN-modified epoxies. Wear rate was quite dramatically reduced with some of the modifiers. Wear results are discussed in terms of the fatigue wear theory. GRA

N84-19583# Army Materials and Mechanics Research Center, Watertown, Mass.
EVALUATION OF THE EPOXY SYSTEM FOR THE REPAIR OF FUEL TANK M109 Final Report
R. E. Scher, L. M. Chow, and J. M. Sloan Sep. 1983 14 p
(DA Proj. 1L1-62105-AH-84)
(AD-A136923; AMMRC-TR-83-55) Avail: NTIS HC A02/MF A01 CSCL 11/9

The repair time to completely process and repair the fuel tank NSN 2910-00-937-9539, M109, has been found to take approximately 36 hours. Production engineering requires a more productive method of repair, especially the time factor. Infrared analysis was utilized to optimize the repair time to yield a well-cured epoxy repair system. It was found that room temperature curing takes an indefinite time to cure. A temperature of 83C is the minimum temperature required for a reasonably cured system and 121C is the temperature required for complete cure. Author (GRA)

N84-19584# Army Fuels and Lubricants Research Lab., San Antonio, Tex.
APPLICATION OF MILITARY LUBRICANTS IN COMMERCIAL HYDRAULIC/POWER TRANSMISSION SYSTEMS AND COMPONENTS Final Report, Jun. - Sep. 1983
H. W. Marbach, Jr. and S. J. Lestz Sep. 1983 37 p
(Contract DAAK70-80-C-0034)
(AD-A136937; AFLRL-170; SWRI-6077/1) Avail: NTIS HC A03/MF A01 CSCL 11/8

The MACI Hydraulic System and Components Program was selected to perform technical evaluation and assessment of commercially available qualified and fielded military specification lubricants and to determine if such oils can be used as hydraulic lubricants in Army commercial Construction Equipment (CCE) and Selected Material Handling Equipment (SMHE). Eight military specification lubricants: one MIL-H-46001C Grade 3, one MIL-L-2104C Grade 10W, one MIL-L-46167 Arctic equivalent to Grade 0W-20 and five MIL-L-46152B Grade 15W-40 were extensively evaluated using eleven selected tests required by manufacturers and one test developed by AFLRL in conjunction with John Deere personnel. From the data developed, the Army lubricants passed 90 percent of all the tests. Also, from the data presented, it appears

that the MIL-L-46152B Grade 15W-40, the MIL-L-2104C Grade 30, the majority of the grade 10W, and possibly the MIL-H-46001C Grade 3 and MIL-L-46167 equivalent to Grade 0W-20 (in cold climates) lubricants are good potential candidates for use as hydraulic and power transmission lubricants within the Army CCE/SMHE system. GRA

N84-19585# Utah Univ., Salt Lake City. Dept. of Chemistry.
POLYMERIZATION OF 3-METHYL-2,5-DIBROMOTHIOPHENE UTILIZING N-BUTYL LITHIUM AND COPPER(II) CHLORIDE
Adel Amer, Hans Zimmer, Kevin J. Mulligan, Harry B. Mark, Stanley Pons, and Jerome F. McAleer 6 Jan. 1984 12 p
(Contract N00014-83-K-0470; NR Proj. 359-718)
(AD-A136955; AD-E001638; TR-20) Avail: NTIS HC A02/MF A01 CSCL 07/3

In recent years, there have been extensive research activities focussed on macromolecules with extended pi-electron system. Among the many macromolecules studied, conjugated olefinic compounds (polyenes), have been given much attention. Various methods for their synthesis have been reported. In the heterocyclic category, there are four reports on the synthesis of poly(3-substituted-2,5-thienylene) (substituent = H, CH3) via coupling of 3-substituted-2,5-dibromothienylmagnesium by nickel salt promoters. Recently Afanas'ev, et al. reported also about the preparation of poly(2,5-thienylene) by an electrochemical method. The ability for charge transport through the thiophene polymer chain is an important criterion for achieving high conductivity. For that reason the synthesis of polyenes was studied. The present investigation was undertaken to improve the synthesis of poly(3-methyl-2,5-thienylene) and to obtain a magnesium free material. n-Butyl lithium was used as dehaloginating agent. Cu(II) chloride was utilized to serve as catalyst. GRA

N84-19586# Cincinnati Univ., Ohio.
TICA (TORSION IMPREGNATED CLOTH ANALYSIS) STUDY OF HIGH-TEMPERATURE THERMOPLASTICS Final Report, 25 Aug. 1982 - 24 Aug. 1983
J. R. Fried and A. Letton 13 Dec. 1983 19 p
(Grant AF-AFOSR-0301-82; AF Proj. 2303)
(AD-A137048; AFOSR-83-1311TR) Avail: NTIS HC A02/MF A01 CSCL 11/9

Methods have been developed to obtain relaxation spectra for highly filled cloth composites by application of torsion impregnated cloth analysis (TICA) techniques. Comparison of spectra for filled and unfilled polysulfone samples suggest that polymer-filler interactions result in substantial broadening of the relaxation time distribution although there is little change in shift parameters, glass transition temperatures, or Arrhenius activation energies. In addition, TICA loss modulus measurements suggest the presence of a previously reported weak relaxational process (liquid-liquid transition) above the glass transition temperature. Dynamic mechanical measurements of polysulfone torsion bars indicate the presence of two secondary relaxations below the glass transition temperature. These include a strong gamma peak near - 100 deg C and weak beta peak near 60 deg C. Annealing or slow cooling results in a suppression of the beta peak and intensifications of the high temperature side of the gamma peak which appears to correlate with a small decrease in impact strength. Preliminary quantum mechanical calculations suggest that the gamma relaxation may represent contributions from methyl group rotations and swivel motions of isopropylidene and diphenyl sulfone moieties while more energetic diphenyl ether swivels may be responsible for the beta relaxation. No effect of thermal conditioning in the region of the liquid-liquid transition has been observed. GRA

N84-19587# Utah Univ., Salt Lake City. Dept. of Chemistry.
ANODIC OXIDATION OF FURANS IN APROTIC SOLVENTS
S. Pons and A. S. Hinman 6 Jan. 1984 20 p
(Contract N00014-83-K-0470)
(AD-A137081; TR-26) Avail: NTIS HC A02/MF A01 CSCL 07/3

The anodic oxidation of furans in the presence of substituted 1,4-napthoquinones leads to coupling of the two. In the absence of the quinones, furan oligomers are formed. Further oxidation of these oligomers leads to the formation of conductive polymer films at the electrode surface. Author (GRA)

N84-19588# Columbia Univ., New York. Dept. of Chemistry.
THE MECHANISM OF ZIEGLER-NATTA POLYMERIZATION OF ACETYLENE: A NUTATION NMR STUDY
T. C. Clarke, C. S. Yannoni, and T. J. Katz 9 Dec. 1983 14 p
(Contract N00014-79-C-0683)
(AD-A137089; TR-7) Avail: NTIS HC A02/MF A01 CSCL 07/4

Using nutation NMR spectroscopy the distance between adjacent 13C labels was measured in samples of polyacetylene prepared by polymerizing a dilute solution of double 13C-labelled acetylene in 12C-acetylene using titanium tetra-n-butoxide plus triethylaluminum as a catalyst. The experiments accord with expectation if the polymerization proceeds by a four-center insertion mechanism rather than by a metallacycle mechanism involving metal-carbenes. Author (GRA)

N84-19589# Columbia Univ., New York. Dept. of Chemistry.
POLYMERIZATIONS OF ACETYLENES AND CYCLIC OLEFINS INDUCED BY METAL-CARBYNES
T. J. Katz, T. H. Ho, N. Shih, Y. Ying, and V. I. W. Stuart 9 Dec. 1983 51 p
(Contract N00014-79-C-0683)
(AD-A137090; TR-5) Avail: NTIS HC A04/MF A01 CSCL 07/4

Trans-(bromotetracarbonyl(phenylmethylidyne)tungsten) and related metal-carbynes induce acetylenes and cycloalkenes to polymerize. The acetylenes include examples that are monosubstituted, disubstituted, and unsubstituted, as well as the first reported functionalized acetylenes in which the functional groups (the nitrile, ester, and halogen functions were studied) are not attached to the triple bond. The cycloalkenes yield polyalkenamers whose double bonds are largely cis. This last polymerization is speeded by the presence of oxygen. The stereochemistries of the polyacetylenes and the polynorbornemer produced when the initiator is the metal-carbyne are similar to those of the polymers produced when the initiator is pentacarbonyl(methoxyphenylmethylene) tungsten. A possible mechanism is presented to account for why the metal-carbynes behave as though they were sources of reactive metal-carbenes. Author (GRA)

N84-19590# Oak Ridge National Lab., Tenn.
CERAMIC COATINGS FOR HEAT ENGINE MATERIALS: STATUS AND FUTURE NEEDS
W. J. Lackey, D. P. Stinton, G. A. Cerny, L. L. Fehrenbacher, and A. C. Schaffhauser 1983 15 p refs Presented at Intern. Symp. on Ceramic Components for Engines, Hakone, Japan, 17 Oct. 1983
(Contract W-7405-eng-26)
(DE84-003401; CONF-8310183-3) Avail: NTIS HC A02/MF A01

The current status and future potential for application of ceramic coatings to diesel and turbine engine components were assessed. Properties were tabulated for numerous materials from the oxide, carbide, nitride, and boride families. Promising new deposition methods and in-situ gas and solid phase characterization techniques are identified. Emphasis was placed on zirconia thermal barrier coatings, but coatings for reducing wear, erosion, and friction were also addressed. The use of coatings will expand in the future and permit higher performance and more reliable heat engines. DOE

N84-19591# Pennsylvania State Univ., University Park. Lab. for Materials Research.
STRUCTURE OF GLASSES CONTAINING TRANSITION METAL IONS Annual Progress Report, 1 Nov. 1982 - 31 Oct. 1983
William B. White, David G. Minser, Diane S. Knight, Celia I. Merzbacher, and Barbara L. Walden 10 Dec. 1983 21 p refs
(Contract DE-AC02-76ER-02754)
(DE84-004211; DOE/ER-02754/9; COO-2754-9) Avail: NTIS HC A02/MF A01

Studies on structure, phase separation, and the behavior of transition metal ions in alkaline earth-silicate glasses and on

theoretical models for the thermodynamic behavior of glasses are described. On-going work on chromium in borate glasses and on the structural environment of alkali ions in alkali silicate glasses is discussed. DOE

N84-19592# Los Alamos Scientific Lab., N. Mex.
PATTERN FORMATION BY SHOCK PROCESSES
J. W. Shaner 1983 22 p refs Presented at the Fronts, Interfaces and Patterns Conf., Los Alamos, N. Mex., 2 May 1983
(Contract W-7405-eng-36)
(DE83-015249; LA-UR-83-2113; CONF-8305110-6) Avail: NTIS HC A02/MF A01

Shock waves in condensed media often produce and leave behind periodic patterns and textures. These patterns were observed both in real time and in postmortem examination. In many cases the patterns are related to analogous pattern-forming mechanisms in classical fluid dynamics, such as the Rayleigh-Taylor and Helmholtz instabilities. In other cases, the textures arise from peculiarities in the dynamic stress state immediately behind the leading edge of the shock wave. Periodic waves in the interface between two shock welded metals have a close resemblance to the classical Helmholtz instability. From a practical point of view, these waves are crucial to the formation of a good bond. Impulsive acceleration of an interface results in the Meshkov instability, which forms patterns qualitatively similar to the Rayleigh-Taylor instability driven by continuous acceleration. However, the patterned stress state left behind after a shock crosses a perturbed interface results in perturbation growth for shock propagation in either direction across the interface. DOE

N84-19593# Instituto Nacional de Tecnica Aeroespacial, Esteban Terradas, Torrejon de Ardoz (Spain).
IMPROVING A CHEMICAL METHOD TO DETERMINE THE EPOXY EQUIVALENT IN EPOXY RESINS [PUESTA A PUNTO DE UN METODO POR VIA QUIMICA PARA LA DETERMINACION DEL EQUIVALENTE EPOXI EN RESINAS EPOXIDICAS]
M. Centeno Perez 9 Jun. 1983 8 p In SPANISH
(Rept-I-4/241/720/83.063) Avail: NTIS HC A02/MF A01

The Dijkstra and Dahmen method for determining epoxy equivalent in resins was improved. Results obtained on three commercial resins are given. The dispersion of the results confirms the validity of the method, which also gives average values within producer specifications. Author (ESA)

N84-19594# Bureau of Mines, University, Ala.
CORROSION RESISTANCE OF CERAMIC MATERIALS TO HYDROCHLORIC ACID
James P. Bennett Oct. 1983 21 p
(PB84-131333; BM-RI-8807; LC-83-600227) Avail: NTIS HC A02/MF A01 CSCL 11B

To identify construction materials for emerging technology in chemical and metallurgical processes, the acid resistance of ceramic materials was investigated. Eight commercial ceramic materials comprising two red shale, two fire clay, a silica, a five clay-bonded silicon carbide, a carbon, and a high-alumina brick were evaluated. Samples were exposed for 110 days to 20 wt% HCl at 50, 70 and 90 C and to 30 wt pct HCl at 70 C. No significant changes in cold crushing strength, volume, or weight were detected. The leach rates of Al, Ca, Fe, K, Mg, Na, Si, and Ti ions were monitored. The carbon brick sample had the best acid-resistant properties with a maximum total leached ion weight loss of 0.004 wt%. The silicon carbide, the silica, and one of the fire clay bricks also had excellent acid-resistant properties. GRA

N84-19595# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
TRANSIENT HORIZONTAL FLAME SPREAD TESTS ON CELLULAR PLASTICS - EXPERIMENTAL RESULTS, VOLUME 1
Seng-Chuan Tan Oct. 1983 108 p
(PB84-135458; HOME-FIRE-PROJECT-TR-53-Vol-1; NBS-GCR-83-445-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 11I

Experimental results from measurements of the characteristics of transient horizontal flame spread over cellular plastics under the influence of external radiation are presented. The measurements made include the radial spread of fire, mass pyrolysis rate, radiative and convective power released by fire and the production and consumption of gas species by fire. The efficiency of burning of various plastics is also presented. The plastics used are primarily cellular foams obtained from the PRC materials bank. Volume 1 contains the description and discussion of the experimental procedures and computations. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-19596# Naval Research Lab., Washington, D. C. Combustion and Fuels Branch.
MICROBIAL DETERIORATION OF HYDROCARBON FUELS FROM OIL SHALE, COAL AND PETROLEUM. III: INHIBITION OF FUNGI BY FUELS FROM COAL Final Report
R. A. Neihof and M. E. May 16 Jan. 1984 27 p
(AD-A137177; NRL-MR-5253) Avail: NTIS HC A03/MF A01 CSCL 21/4

The anticipated future need for hydrocarbon fuels from sources other than petroleum has impelled a thorough evaluation of the properties of such fuels, including their susceptibility to microbial contamination. The present work confirmed an earlier finding that a JP-5 fuel derived from coal by the Char Oil Energy Development (COED) process was inhibitory to typical fungal contaminants and showed that the inhibition extended to fuels produced by solvent refining as well as to a variety of COED fuels refined in different ways. The inhibition was not due to lack of a suitable aliphatic carbon source. Extraction of COED JP-5 fuel with aqueous solutions showed that the inhibitor(s) had a very low water solubility and was not markedly concentrated at the water/fuel interface. An experiment with silica gel as adsorbent indicated that solid adsorbents may furnish a means of removing and concentrating sufficient amounts of the inhibitor for identification. Additional work to identify the source of the fungal inhibition in coal fuel is worthwhile not only because of the pronounced and selective effects produced but because a novel inhibitor may be found which would be useful as a fuel-compatible biocide for controlling microbial contamination in any stored hydrocarbon fuel. Author (GRA)

N84-19597# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
HEAT TRANSFER AND THERMAL STABILITY OF ALTERNATIVE AIRCRAFT FUELS, VOLUME 1 Final Report, 1 Jan. 1982 - 1 Feb. 1983
J. A. TeVelde and M. R. Glickstein Nov. 1983 90 p 2 Vol.
(Contract N00140-80-C-Q097; NR Proj. Z08-38)
(AD-A137404; PWA/GPD-FR-17404-Vol-1; NAPC-PE-87-C-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 21/4

A test and evaluation program was conducted to determine the heat transfer and thermal stability characteristics of several selected alternative fuels. Accelerated fuel coking tests were conducted with three alternative fuels and a specification grade JP-5 fuel, in a heated tube apparatus. Test conditions included both simulated engine conditions and higher-temperature accelerated coking conditions. Resulting deposit rates were evaluated and correlated as a function of the test conditions. Deposit effects on heat transfer were also evaluated and correlated as a function of test condition. Author (GRA)

N84-19598# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
HEAT TRANSFER AND THERMAL STABILITY OF ALTERNA-

TIVE AIRCRAFT FUELS. VOLUME 2: APPENDICES Final Report, 1 Jan. 1982 - 1 Feb. 1983
J. A. TeVelde and M. R. Glickstein Nov. 1983 96 p 2 Vol.
(Contract N00140-80-C-0097; NR Proj. Z08-38)
(AD-A137405; PWA/GPD-FR-17404-Vol-2; NAPC-PE-87-C-Vol-2)
Avail: NTIS HC A05/MF A01 CSCL 21/4

The results from the alternative aircraft fuel tests are reported. The tests were conducted on three alternative fuels and a specific grade J-5 fuel. B.G.

N84-19599# Defence Research Establishment, Ottawa. (Ontario). Energy Systems Sect.
EFFECTS OF FUELS ON THE PHYSICAL PROPERTIES OF NITRILE RUBBER O-RINGS
J. R. Coleman and L. D. Gallop Sep. 1983 26 p
(AD-A136647; DREO-TN-82-41) Avail: NTIS HC A03/MF A01 CSCL 11/1

The effects were of sa variety of fuels and fuel blends on nitrile O-rings were studied. Properties (tensile strength, elongation, swelling) depended markedly on the aromatic content. When O-rings were cycled between fuels of low and high aromatic content, these properties took up values characteristic of the fuel in which the sample was currently immersed. Rubber samples were exposed to a commercial fuel (gas oil side stream) of high (greater than 40%) aromatics level and to a Jet A-1 fuel, initially meeting aromatics specifications, whose aromatics content had been artificially increased by addition of reagent chemicals to the same final level as the gas oil side stream. Effects on physical properties (tensile strength, swell, 200% modulus) were considerably greater for the Jet A-1 with added aromatics than for the gas oil side stream. GRA

N84-19600# Defence Research Establishment, Ottawa. (Ontario). Energy Systems Sect.
PROPERTIES OF FUELS EMPLOYED IN A GAS TURBINE COMBUSTOR PROGRAM
J. R. Coleman and L. D. Gallop Sep. 1983 20 p
(AD-A136663; DREO-TN-82-42) Avail: NTIS HC A02/MF A01 CSCL 21/4

A compilation has been made of the physical and chemical properties of sixteen fuels employed in an aircraft gas turbine combustor programme. Several of these are specification fuels of the kerosene or wide-cut type. Others have been chosen to exhibit systematic variations mainly in the direction of out-of-specification boiling range or aromatics level or both. Some are of non-petroleum origin, derived from oil shale or tar sands, or are synthetic fuels (JP10, RJ6). Complete specification testing was conducted on these fuels, and detailed non-specification property determination-simulated distillation by gas chromatography, thermal stability breakpoint, density, specific heat, viscosity, surface tension and true vapor pressure, all as a function of temperature; heats of combustion, hydrogen content, and detailed hydrocarbon compositional analysis. Author (GRA)

N84-19601# Army Natick Research and Development Command, Mass.
DECOMPOSITION OF FOUR AMMONIUM NITRATE PROPELLANTS Final Report
D. L. Kaplan, D. J. Emerson, P. A. Riley, and A. M. Kaplan Apr. 1983 68 p
(DA Proj. 1T1-62720-D-048)
(AD-A136916; NATICK/TR-83/045) Avail: NTIS HC A04/MF A01 CSCL 07/3

The biodegradability of four ammonium nitrate propellants, trimethylammonium nitrate (TMAN), isopropylammonium nitrate (IPAN), triethanolammonium nitrate (TEAN), and hydroxylammonium nitrate (HAN) was assessed in batch and continuous cultures under a variety of conditions. IPAN, TMAN, and TEAN were decomposed under aerobic conditions in batch and continuous cultures in a variety of media. Under anaerobic conditions in batch systems and denitrification conditions in continuous flow systems TMAN and TEAN were decomposed while IPAN was incompletely degraded. No significant build-up of intermediates was observed under any of the conditions studied. All three compounds were readily decomposed in soils at a variety of concentrations and in a range of different soil types. HAN was found to be chemically unstable down to a pH of 5.9. All four compounds tested negative in the Ames screening test for mutagenicity. The contamination of stock solutions of TMAN and TEAN with nitrosamines may present the biggest hurdle to overcome in looking towards successful biological treatment of these propellants. GRA

N84-19602# Coordinating Research Council, Inc., Atlanta, Ga.
THE RELATIONSHIP BETWEEN VEHICLE FUEL TEMPERATURE AND AMBIENT TEMPERATURE. 1981 CRC (COORDINATING RESEARCH COUNCIL) KAPUSKASING FIELD TEST Final Contractor Report
K. H. Strauss Dec. 1983 81 p
(Contract DAAK70-81-C-0128)
(AD-A136948; AD-E001638; CRC-537) Avail: NTIS HC A05/MF A01 CSCL 21/4

A total of 214 overnight cooling curves, obtained on four diesel cars and three heavy-duty diesel trucks during January through April 1981 in Kapuskasing, Ontario, Canada, were analyzed to establish relationships between ambient and fuel tank temperatures. The closest relationship was found to be between fuel tank temperature at the end of an overnight cooldown and the average of the ambient temperature for the last three hours, the fuel being 2.2 C warmer on the average. The average difference between fuel tank and minimum ambient temperature was 3.6 C. No significant difference was observed between the final fuel tank temperatures of cars and the final fuel tank temperatures of the heavy-duty trucks, at the fill levels used in this program, when parked outdoors overnight. Author (GRA)

N84-19603# Aerospace Corp., El Segundo, Calif. Energy Conservation Directorate.
WATER AND ALCOHOL USE IN AUTOMOTIVE DIESEL ENGINES: ALTERNATIVE FUELS UTILIZATION PROGRAM
J. J. Donnelly, Jr. and H. M. White Sep. 1983 189 p refs
(Contracts DE-AI01-82CS-50286; F04701-82-C-0083)
(DE84-004196; DOE/CS-50286/4) Avail: NTIS HC A09/MF A01

Seven methods of using alcohols as supplements or complete replacements for petroleum-based diesel fuel were assessed from engine test results. The methods investigated include the dual-fuel techniques of emulsification, blending, fumigation, and dual-injection, as well as the monofuel techniques of cetane number improvement, spark ignition, and ignition by electrically heated surfaces or glow plugs. With the exceptions of alcohol/diesel fuel blends and heated surface ignition, all methods were applied to prototype vehicles and proved successful to some extent in field tests of cars, trucks, buses, or tractors. The changes observed, relative to normal diesel fuel use, in power, fuel consumption, thermal efficiency, and exhaust emissions are documented. Other factors evaluated include diesel fuel displacement by alcohol in specific vehicles and projections of potential domestic fuel savings throughout the transportation sector; fuel cost increases; changes in vehicle system hardware, durability, driveability, and safety; and additional study needs. DOE

N84-19873# Martin Marietta Aerospace, Orlando, Fla.
PYROTECHNIC SHOCK TEST AND TEST SIMULATION
M. E. Hughes *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 83-88 ref (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 19/1

N84-19874# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
STRAIN HISTORIES ASSOCIATED WITH STAGE SEPARATION SYSTEMS USING LINEAR SHAPED CHARGE
D. R. Powers *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 89-96 refs (For primary document see N84-19866 10-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 19/1

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-19604# National Mechanical Engineering Research Inst., Pretoria (South Africa).
DESIGN, SELECTION AND SIMULATION OF AIR CONDITIONING SYSTEMS BY COMPUTER. PART 3: PROGRAM DATA PREPARATION AND REFERENCE MANUAL
Jun. 1976 109 p refs
(CSIR-ME-1465-Pt-3) Avail: NTIS HC A06/MF A01

The procedure to be followed in order to prepare the appropriate data sheets for punching is described. The determination of the heating and cooling energy requirements for an air conditioning system of a building is the application. The program computes the hourly heating or cooling load due to solar radiation through windows, heat transmission through external walls and roofs, partition walls, doors, etc., as well as the load due to occupancy, lighting, equipment, infiltration, and ventilation. Single and/or double glazing with any type of glass can be considered together with the shadow areas on the wall or window caused by elements of the facade or adjacent buildings, in which case the program adjusts the solar load accordingly. The program is based on the algorithms and procedures outlined in references 1 and 2. The storage of heat in the building structure is taken into account and the computation can be made for any day of the year for one or more months, for any orientation of the building and any geographical location for which climatic data are available. Author

N84-19605# Committee on Commerce, Science, and Transportation (U. S. Senate).
ROLE OF TECHNOLOGY IN PROMOTING INDUSTRIAL COMPETITIVENESS
Washington GPO 1984 224 p Hearings on S. 1286 before the Subcomm. on Sci., Technol. and Space of the Comm. on Com., Sci. and Transportation, 98th Congr., 1st Sess., 23 Nov., 6-7 Dec. 1983
(S-REPT-98-565; GPO-29-832) Avail: Subcommittee on Science, Technology and Space

The role of advanced manufacturing technology in competing in markets at home and abroad is examined. N.W.

N84-19606*# Yale Univ., New Haven, Conn. Dept. of Chemical Engineering.
COMPARISONS OF RATIONAL ENGINEERING CORRELATIONS OF THERMOPHORETICALLY-AUGMENTED PARTICLE MASS TRANSFER WITH STAN5-PREDICTIONS FOR DEVELOPING BOUNDARY LAYERS Final Report
Sueleyman A. Goekoglu (Analex Corp.) and Daniel E. Rosner Jan. 1984 17 p refs To be presented at the 29th Intern. Gas Turbine Conf., Amsterdam, 3-7 Jun. 1984
(Contract NAS3-23293; Grant NAG3-201)
(NASA-CR-168221; E-1991; NAS 1.26:168221) Avail: NTIS HC A02/MF A01 CSCL 21E

Modification of the code STAN5 to properly include thermophoretic mass transport, and examination of selected test cases developing boundary layers which include variable properties, viscous dissipation, transition to turbulence and transpiration cooling. Under conditions representative of current and projected GT operation, local application of St(M)/St(M),o correlations evidently provides accurate and economical engineering design predictions, especially for suspended particles characterized by Schmidt numbers outside of the heavy vapor range. Author

N84-19607*# National Aeronautics and Space Administration, Washington, D. C.
INFLUENCE PARAMETERS OF IMPACT GRINDING MILLS
K. Hoeffl, K. Husemann, and Hans Goldacker Feb. 1984 13 p refs Transl. into ENGLISH from Silikattechnik (East Germany), v. 32, no. 7, 1981 p 213-215 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77352; NAS 1.15:77352) Avail: NTIS HC A02/MF A01 CSCL 21E

Significant parameters for impact grinding mills were investigated. Final particle size was used to evaluate grinding results. Adjustment of the parameters toward increased charge load results in improved efficiency; however, it was not possible to define a single, unified set to optimum grinding conditions. Author

N84-19608# New Mexico Univ., Albuquerque.
DEVELOPMENT OF CRITERIA FOR THE USE OF ASPHALT-RUBBER AS A STRESS-ABSORBING MEMBRANE INTERLAYER (SAMI) Final Report, Sep. 1979 - Jun. 1983
David E. Newcomb and R. Gordon McKeen Tyndall AFB, Fla. AFESC Dec. 1983 150 p
(Contract F29601-81-C-0013; AF Proj. 2054)
(AD-A137412; NMERI-TA5-11; AFESC/ESL-TR-83-50) Avail: NTIS HC A07/MF A01 CSCL 13/2

This report documents over 2 years of research efforts to characterize asphalt-rubber mixtures to be used in Stress-Absorbing Membrane Interlayers (SAMI). The purpose of these SAMIs is to retard or prevent reflection cracking in asphalt-concrete overlays. Several laboratory experiments and one field trial were conducted to define significant test methods and parameters for incorporation into construction design and specification documents. Test methods used in this study included a modified softening point test, force-ductility, and Schweyer viscosity. Variables investigated included (1) Laboratory-mixing temperature; (2) Rubber type; (3) Laboratory storage time; (4) Laboratory storage condition; (5) Laboratory batch replication; (6) Laboratory mixing time; (7) Field mixing time; (8) Laboratory test temperature; (9) Force-Ductility elongation rates; and (10) Asphalt grade. It was found that mixing temperature, mixing time, rubber type, and asphalt grade all have significant effects upon the behavior of asphalt-rubber mixtures. Significant variability was also noticed in different laboratory batch replications. Varying laboratory test temperature and force-ductility elongation rate revealed further differences in asphalt-rubber mixtures. GRA

N84-19609# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Concrete Technology Information Analysis Center.
PREVENTATIVE MEASURES TO LIMIT STRESS CORROSION CRACKING IN PRESTRESSED CONCRETE Final Report
Edward F. ONeil Sep. 1983 19 p Presented at the 3rd Symp. on Stress Corrosion of Prestressing Steel, Madrid, 22-23 Sep. 1981
(AD-A136665; WES/MP/SL-83-14; CTIAC-64) Avail: NTIS HC A02/MF A01 CSCL 11/6

In the past decade, the most significant advances in the area of protection of prestressing steel from stress corrosion cracking have come in the fields of metallurgy and concrete materials. These efforts have developed from a more precise understanding of the mechanisms that cause stress corrosion cracking in prestressing steel, and development of concreting materials that provide greater protection for these steels. This report deals with two aspects of steel protection. First, with respect to the steel itself, new insights into the structure of the prestressing steels have shown metallurgists the conditions under which stress cracks form and advance, as well as ways in which to modify the physical properties of the steel to minimize the possibility of crack formation and advancement. Secondly, in the field of concrete materials, the emphasis on prevention of corrosion to steel has been in the area of durability of the concrete that protects the steel. Lower water-cement ratios and concretes with lower permeability exclude deleterious materials from the surface of the steel. New materials and procedures are discussed that have been designed to limit the penetration of corrosive elements that may attack the steel at the grain boundaries and initiate brittle failure. Author (GRA)

N84-19610# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
REPAIR AND RESTORATION OF PAVED SURFACES. PHASE 2: BACKFILLING OF CRATERS Interim Report, Fiscal Year 1982
V. C. Barber Oct. 1983 25 p
(AD-A135745; WES/TR/GL-83-16) Avail: NTIS HC A02/MF A01 CSCL 13/2

The purpose of Phase II of REREPS (repair and restoration of paved surfaces) is to evaluate previously developed techniques and materials and to conduct necessary studies to determine the most beneficial backfill material. The study is to include new materials and innovative methodology to the greatest practicable extent. Compaction requirements are to be analyzed by comparison with existing requirements as modified by REREPS results to date. Specific compaction requirements include a quantification of compaction requirements versus depth below the load as well as subgrade compaction versus pavement strength and stiffness. Another specific requirement is to study the applicability of the sand grid support concept. In addition, other new methods and materials will be reviewed, developed, and/or introduced, as appropriate. This study constitutes partial completion of these objectives. An investigation research effort has been made to review the status of REREPS development to data. GRA

N84-19611# Kelvinator Compressor Co., Grand Rapids, Mich.
RESEARCH AND DEVELOPMENT OF ENERGY-EFFICIENT APPLIANCE MOTOR-COMPRESSORS. VOLUME 4: PRODUCTION DEMONSTRATION AND FIELD TEST
Marc G. Middleton and R. Stuart Sauber Sep. 1983 72 p
(Contract W-7405-eng-26)
(DE84-005083; ORNL/Sub-78-7229/4) Avail: NTIS HC A04/MF A01

Two models of a high efficiency compressor for low back pressure applications were manufactured. Many changes required production process changes. The compressors were used in top mount refrigerator freezers. The results reveal a 27.0% improvement in energy consumption for the 18 ft(3) high efficiency model and a 15.6% improvement in the 21 ft(3) improvement in the 21 ft(3) high efficiency model as compared to the standard production unit. DOE

N84-19612# Pacific Northwest Lab., Richland, Wash.
ADVANCED CLEANING BY MASS FINISHING
M. W. McCoy Oct. 1983 14 p refs Presented at Deburring and Surface Conditioning Conf., Orlando, Fla., 7 Nov. 1983
(Contract DE-AC06-76RL-01830)
(DE84-004850; PNL-SA-111743; CONF-8311116-1) Avail: NTIS HC A02/MF A01

The effectiveness of vibratory finishing for removing a variety of radioactively contaminated soils was investigated by measuring the radiation levels of the test material, the lining of the vibratory finishing tub, and the media. Many soils including corrosion products, scale, oil, grease and paint were removed from steels, aluminum, polyvinyl chloride, plexiglass, glass and flexible materials such as rubber. Zinc, copper, and lead were not cleaned. Results indicate that vibratory finishing should be an effective cleaning process or a variety of manufacturing operations. DOE

N84-19613# Thyssen Schmiedetecnik, Remscheid (West Germany).
PRECISION FORGING OF FRONT FAN BLADES, ABRIDGED VERSION Final Report, Feb. 1982
Otto Voigtlaender and Helmut Degenhardt Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 23 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-205; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5

The manufacturing of titanium alloy front fan blades with ready-for-assembly contact surfaces on conventional counterblow hammers is reported. Thermal contraction and elastic deformation were determined and the tooling was fabricated by computerized design. Forging trials give fan blades which dimensionally and metallurgically meet the requirements.
Author (ESA)

N84-19614# Metallgesellschaft, A.G., Frankfurt am Main (West Germany). Metall-Lab.
DEEP DRAWING OF CONTINUOUSLY CAST AND ROLLED ZINC SHEET Final Report, Jun 1982
Klaus Drefahl, Hans-Joachim Henrich, and Adolf Stradmann (Rheinzink GmbH) Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 45 p refs In GERMAN; ENGLISH summary
(Contract BMFT-01-ZG-098-ZK/NT/NTS-1016)
(BMFT-FB-T-83-214; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9,50

Zinc sheets were deformed by a rotary symmetric deep drawing tool with variable geometry (diameter and radius of die and die plate, drawing gap). Sheets consisted of two continuously rolled ZnCuTi alloys. The effect of holding down drawing speed and lubrication was tested. Results were investigated with a view to industrial scale fabrication. Deep drawing tools were built and successfully applied for mass production of complicated parts.
Author (ESA)

N84-19615# Firma Volker Schach, Worms (West Germany).
MECHANICALLY WORKING FULLY-AUTOMATIC PLANT FOR THE REGENERATION OF USED ALUMINUM CAP SCREWS FOR BOTTLES Final Report, Sep. 1982
Volker Schach and Helu Schach Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 76 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-215; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16

A mechanical separation process for used aluminum cap screws for bottles is described. A prototype separation plant was developed and constructed. Test results indicate low energy consumption, no water pollution, and no emission of noxious vapors. Author (ESA)

N84-19616# Thyssen Schmiedetecnik, Remscheid (West Germany).
DEVELOPMENT OF AN ISOTHERMAL FORMING TECHNIQUE FOR THE PRODUCTION OF PRECISION PARTS MADE FROM TITANIUM ALLOYS Final Report, Mar. 1981
Otto Voigtlaender and Gerhard Guenther Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 33 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-220; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7

Isothermal hot die precision forging of parts with ready-for-assembly contact surfaces is reported. Lifetime of molybdenum alloy and nickel alloy dies, size accuracy of forged parts, their technological properties, and the economy of the technique were examined. Trials were carried out on titanium alloy aireraft engine compressor blades. Results show that the advantages of isothermal precision forging are obtained mainly for bigger parts with thin profiles, e.g., fan blades, which can be forged conventionally without problems only by considering a machining allowance. Cost reductions of 20% are possible. Author (ESA)

N84-19617# Leybold-Heraeus G.m.b.H., Hanau/Main (West Germany). Werksgruppe M.
DEVELOPMENT OF A PROTOTYPE CATHODE SPUTTERING PLANT Final Report, Mar. 1982
Juergen Heimbach, Heinz Hill, Werner Lenz, Meyer, Wolf-Dieter Muenz, Stephan Reineck, Michael Scherer, Hans Schuessler, and Karl-Heinz Schuller Bonn Bundesministerium fuer Forschung und

Technologie Nov. 1983 57 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-251; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12

High power cathode sputtering for the coating of architectural glass with heat insulating or heat reflecting layers is described. Oxide/metal/oxide layer systems with Cu and Ag as IR reflecting metal layer were investigated. An 83% transmission in the visible region and 90% IR reflection with a high degree of color neutrality are achieved with the indium tin oxyde/Ag/indium tinoxyde system. Transparent, conductive ITO layers were investigated. By using specially manufactured, conductive, hot pressed ITO targets without thermal pre or postprocessing, 350nm thick layers with > 80% transmission and 90% IR reflection and with good color neutrality are produced. For sun glasses 40% reflection and 8% transmission with a high corrosion resistance are achieved with stainless steel/chromium and TiC coating of a sandwich structure, e.g., SnO2/TiC. The reflection color can be adjusted by varying the SnO2 layer thickness without significant transmission change.
Author (ESA)

N84-19618# SRI International Corp., Menlo Park, Calif. Artificial Intelligence Center.
MACHINE INTELLIGENCE RESEARCH APPLIED TO INDUSTRIAL AUTOMATION Final Report, 1 May 1981 - 30 Apr. 1983
David Nitzan, Stephen T. Barnard, Robert C. Bolles, Ronald A. Cain, Marsha Jo Hannah, James A. Herson, John W. Hill, Patrice Horaud, Jan H. Kremers, Scott H. Mathews et al Jun. 1983 159 p refs
(Grant NSF DAR-80-23130)
(PB84-123348; NSF/MEA-83011) Avail: NTIS HC A08/MF A01 CSCL 13H

Research was undertaken to explore and develop general purpose, cost-effctive techniques and hardware/software modules for computer-controlled systems of manipulators, sensors, and other components that are flexible, adaptable and easily trained to perform material handling, inspection, and assembly tasks. Seven published papers, resulting from this research, are included. They address such topics as recognition and location of partially visible objects, the SRI robot programming system, a modular programmable assembly station, an assessment of robot sensors, and applications of image understandin to industrial automation.
Author (GRA)

N84-19619# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Electromagnetic Fields and Acoustic Sect.
HAZARD ANALYSIS FOR MAGNETIC INDUCTION FROM ELECTRIC TRANSMISSION LINES Final Report
Robert J. Taylor Jun. 1983 90 p refs
(PB84-125236; PPSP/JHU/PPSE-T-23) Avail: NTIS HC A05/MF A01 CSCL 13L

The potential hazard of magnetic induction from electric transmission lines was investigated. A literature search was accomplished, measurements were made and compared with the theories found in the literature and a new approach was developed for estimating the hazardous potential of magnetically induced voltage in fences which could be grasped by barefoot children under wet conditions. Conditions under which representative transmission lines could induce such voltage were explored. For example, a standard three-phase horizontal 500 KV transmission line carrying 1000 A was estimated to induce 10.5 V in a 900 M fence 30 M from the center of the line. It was also found that third harmonic currents can magnetically induce significant voltages compared to those induced by 60 HZ currents umder some circumstances.
Author (GRA)

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-19620*# Illinois Univ., Urbana. Electromagnetics Lab.
NUMERICAL METHODS FOR ANALYZING ELECTROMAGNETIC SCATTERING Semiannual Report, 25 Sep. 1983 - 24 Mar. 1984
Y. T. Lo and S. W. Lee 23 Mar. 1984 21 p refs
(Grant NAG3-475)
(NASA-CR-175423; NAS 1.26:175423) Avail: NTIS HC A02/MF A01 CSCL 20N

The wave propagation inside a cylindrical waveguide, coated with lossy dielectric material due to the incidence of a plane wave at the open end of the guide, was studied. The general properties of the normal mode propagation were investigated. N.W.

N84-19621*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA ACQUISITION REPORT Progress Report, Oct. - Dec. 1983
E. C. Posner, ed. 15 Feb. 1984 220 p refs
(NASA-CR-173263; JPL-TDA-PR-42-76; NAS 1.26:173263) Avail: NTIS HC A10/MF A01 CSCL 17B

Developments in space communications, radio navigation, radio science, ground-base radio astronomy, reports on the Deep Space Network (DSN) and its Ground Communications Facility (GCF), and applications of radio interferometry at microwave frequencies are discussed. For individual titles, see N84-19622 through N84-19633.

N84-19622*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANOTHER LOOK AT THE OPTIMUM FREQUENCIES FOR A WATER VAPOR RADIOMETER c35
G. M. Resch *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 1-11 refs (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 14B

A water vapor radiometer is used to estimate the columnar content of atmospheric water vapor or equivalently the line-of-sight path delay due to water vapor. Two measurement channels are used in order to separate the effects of the liquid and vapor phases of water. The efficiency of the path delay or columnar vapor estimate is dependent on the choice of on-line frequency channel. Previous analysis of this problem has suggested frequencies from 20.3 to 21 GHz. The frequency that yields the minimum error in the inversion algorithm is shown here to be both site and season dependent. Hence, the concept of an optimum frequency must represent an averaging process over the entire range of meteorological conditions that is expected. For a range of sites and condition representing a cross section of the continental United States the optimum on-line frequency seems to be 20.6 GHz.
Author

N84-19623*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INVERSION ALGORITHMS FOR WATER VAPOR RADIOMETERS OPERATING AT 20.7 AND 31.4 GHz c35
G. M. Resch *In its* The Telecommun. and Data Acquisiton Rept. 15 Feb. 1984 p 12-26 refs (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 14B

Eight water vapor radiometers (WVRs) were constructed as research and development tools to support the Advanced System Programs in the Deep Space Network and the Crustal Dynamics Project. These instruments are intended to operate at the stations of the Deep Space Network (DSN), various radio observatories, and obile facilities that participate in very long baseline interferome-

tric (VLBI) experiments. It is expected that the WVRs will operate in a wide range of meteorological conditions. Several algorithms are discussed that are used to estimate the line-of-sight path delay due to water vapor and columnar liquid water rom the observed microwave brightness temperatures provided by the WVRs. In particular, systematic effects due to site and seasonal variations are examined. The accuracy of the estimation as indicated by a simulation calculation is approximately 0.3 cm for a noiseless WVR in clear and moderately cloudy weather. With a realistic noise model of WVR behavior, the inversion accuracy is approximately 0.6 cm. Author

N84-19624*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DSN MICROWAVE ANTENNA HOLOGRAPHY c35

D. J. Rochblatt and B. L. Seidel *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 27-42 refs (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 14E

The DSN microwave antenna holography project will obtain three-dimensional pictures of the large DSN antenna surfaces. These pictures must be of suffi icient resolution to allow adjustment of the reflector panels to an rms surface of 0.5 mm (0.25 mm, goal). The major parameters and equations needed to define a holographic measurement system are outlined and then the proof of concept demonstration measurement that was made at DSS-43 (Australia) that resulted in contour maps with spatial resolution of 7 m in the aperture plane and resolution orthogonal to the aperture plane of 0.7 mm was discussed. Author

N84-19625*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

LOOP GAIN AND CIRCUIT PARAMETERS FOR RESIDUAL CARRIER TRACKING IN THE ADVANCED DSN BLOCK V RECEIVER

P. H. Young *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 43-52 refs (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 17B

A circuit level analysis for residual carrier tracking of a deep space network signal by a proposed Block V receiver as conceived by the Receiver Advanced Development Team is presented. The objective is to aid the circuit designer in selection of loop parameters to achieve the required performance objectives. The topics specifically addressed are: (1) loop stability and gain requirements, (2) loop component parametric equations, and (3) phase detector technology. Author

N84-19626*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

X-BAND UPLINK GROUND SYSTEMS DEVELOPMENT

C. E. Johns *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 53-57 ref (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 17B

The development of the X-band exciter and Doppler extractor equipment for the X-band uplink was completed. Stability measurements were made on the exciter and Doppler reference signals and the results are presented. Author

N84-19627*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DOPPLER SYSTEM PHASE TRANSFER FUNCTIONS FOR A SYSTEM WITH AN X-BAND UPLINK AND X-BAND AND S-BAND DOWNLINKS

M. A. Koerner *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 58-69 (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 17B

A new DSN RF system is being developed that transmits at X-band and receive at both X-band and S-band. End-to-end tests are planned to measure the phase stability of this system. Equations for the phase transfer functions between the error sources in the system and the X-band and S-band Doppler extractor outputs are derived. This analysis considers both test modes, using a test translator, and actual spacecraft tracking where the spacecraft is at some distance from the DSN station. The results indicate that the proposed end-to-end tests will not accurately reflect the error that occurs during actual spacecraft tracking. Author

N84-19628*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

TRANSFER FUNCTION BOUNDS FOR PARTIAL-UNIT-MEMORY CONVOLUTIONAL CODES BASED ON REDUCED STATE DIAGRAM c60

P. J. Lee *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 70-76 refs (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 09B

The performance of a coding system consisting of a convolutional encoder and a Viterbi decoder is analytically found by the well-known transfer function bounding technique. For the partial-unit-memory byte-oriented convolutional encoder with m sub 0 binary memory cells and (k sub 0 > m sub 0) inputs, a state diagram of 2(K) (sub 0) was for the transfer function bound. A reduced state diagram of (2 (m sub 0) +1) is used for easy evaluation of transfer function bounds for partial-unit-memory codes. Author

N84-19629*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SIMULATIONS FOR FULL UNIT-MEMORY AND PARTIAL UNIT-MEMORY CONVOLUTIONAL CODES WITH REAL-TIME MINIMAL-BYTE-ERROR PROBABILITY DECODING ALGORITHM c61

Q. D. Vo *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 77-85 refs (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 09B

A program which was written to simulate Real Time Minimal-Byte-Error Probability (RTMBEP) decoding of full unit-memory (FUM) convolutional codes on a 3-bit quantized AWGN channel is described. This program was used to compute the symbol-error probability of FUM codes and to determine the signal to noise (SNR) required to achieve a bit error rate (BER) of 10 to the minus 6th power for corresponding concatenated systems. A (6,6/30) FUM code, 6-bit Reed-Solomon code combination was found to achieve the required BER at a SNR of 1.886 dB. The RTMBEP algorithm was then modified for decoding partial unit-memory (PUM) convolutional codes. A simulation program was also written to simulate the symbol-error probability of these codes. Author

N84-19630*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SIGNAL-TO-NOISE RATIO AND COMBINER WEIGHT ESTIMATION FOR SYMBOL STREAM COMBINING

Q. D. Vo *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 86-98 refs (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 17B

A method is presented for signal to noise ratio (SNR) and symbol stream combiner weight estimation. The SNR estimator employs absolute value moments as in an earlier method. The main contribution is that a new algorithm is derived for the combiner weight estimator to remove the large bias at low SNRs. The new algorithm is simulated to combine two independent symbol streams at various SNRs. As an example, the combining two symbol streams at SNRs of -1 dB and -7 dB, conbiner weight estimates using 1000 samples for the -1 dB stream and 10,000 samples for the -7 dB stream achieve an output SNR of -0.039 dB, which is just 0.012 dB below the theoretical limit achievable with perfect knowledge of the SNRs. Author

N84-19631*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A SYSTOLIC VLSI DESIGN OF A PIPELINE REED-SOLOMON DECODER c60

H. M. Shao, T. K. Truong, L. J. Deutsch, J. H. Yuen, and I. S. Reed (Univ. of Southern California) *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 99-113 refs (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 09B

A pipeline structure of a transform decoder similar to a systolic array was developed to decode Reed-Solomon (RS) codes. An important ingredient of this design is a modified Euclidean algorithm for computing the error locator polynomial. The computation of inverse field elements is completely avoided in this modification of Euclid's algorithm. The new decoder is regular and simple, and naturally suitable for VLSI implementation. E.A.K.

N84-19632*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ISEE-3 MICROWAVE FILTER REQUIREMENTS c33

J. L. Galvez, H. Marlin, and P. Stanton *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 114-119 ref (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 09A

The 64 m subnet is committed to support the International Sun Earth Explorer (ISEE-3) spacecraft. The uplink and one of the downlink frequencies will be respectively, 2090 and 2217 MHz. As these two frequencies fall outside the normal DSN transmit and receive bands, the 64-m antennas present new filter requirements, which are analyzed. E.A.K.

N84-19633*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

TELEMETRY SIMULATION ASSEMBLY IMPLEMENTATION IN THE DSN c17

M. E. Alberda *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 120-131 (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 09F

The telemetry simulation was implemented as part of the MARK IV network implementation project. The telemetry simulation assembly (TSA) is replacing the Simulation Conversion Assembly (SCA) throughout the DSN. The development of the TSA is discussed, and the design is described to the block diagram level. E.A.K.

N84-19634*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

OPERATOR WORKLOAD MEASUREMENT VALIDATION FOR THE MARK IV DSCC MONITOR AND CONTROL SUBSYSTEM c54

M. LeMay (Montclair State Coll.), E. E. Hird, and B. Y. Rodriquez *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 132-140 refs (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 05H

The validation of some proposed measures of operator workload in a large interactive computer system is described. The tests were conducted on MARK III deep space network (DSN) equipment using experienced operators as subjects. The significant operator workload measure are identified and useful guidelines are obtained on operator task scheduling. E.A.K.

N84-19635*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

FIRST RESULTS OF GPS TIME TRANSFER TO AUSTRALIA c14

J. McK.Luck (ACT, Canberra, Australia), J. R. Woodger (ACT, Canberra, Australia), J. E. Wells (ACT, Tidbinbella, Australia), P. N. Churchill (ACT, Tidbinbella, Australia), and P. A. Clements *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 141-160 refs (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 14B

A global positioning system (GPS) time transfer unit was installed at Tidbinbilla Deep Space Communications Complex of the DSN in June 1983. It was used to estimate the relationship to UTC(USNO MC) of the Tidbinbilla frequency and time system TID(FTS) based on a hydrogen maser, and to estimate the performance of the Australian free-running time scale UTC(AUS). Data from the first 3 months were analyzed three ways: by two-hop common view using JPL as intermediary; by long-arc interpolation of measurements against space vehicle clocks; and by long arc interpolation of GPS-Time results. Residuals from a single quadratic fit through 3 months of UTC(USNO MC) -TID(FTS) results were white noise with standard error 15 ns, and a flying clock measurement gave 70 ns agreement. A straight line fit through results UTC(USNO MC) - UTC(AUS) gave 90 ns standard error and 120 ns agreement. It is proposed to use the GPS measurements to steer UTC(AUS) to UTC(BIH), and to rename the existing time scale TA(AUS). E.A.K.

N84-19636*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

IMPLEMENTATION OF LARGE ANTENNAS FOR DEEP SPACE MISSION SUPPORT

R. Stevens *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 161-169 (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 20N

The large antennas of the DSN support reception of low power telemetry signals from spacecraft (S/C), transmission of high power commands to S/C, and navigation of S/C by precision radiometric data. The specification and design of antennas were driven by the requirement to support those functions with high reliability. The number of antennas required in the DSN is determined by the number of S/C to be supported and their level of activity. A given size antenna aperture can be realized with a single element or by arraying smaller elements with the same total area. That approach can be applied to meeting many DSN requirements. There is a cost vs capability trade-off in arrayed vs single element designs. The operating microwave frequency is an important parameter for the antenna. Major radio astronomy antennas can be arrayed with DSN antennas to increase reception capability. The specification, design, and development of DSN antennas are examined. E.A.K.

N84-19637*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ENHANCED RADIO FREQUENCY CARRIER MARGIN IMPROVEMENTS FOR AN ARRAY OF RECEIVING SYSTEMS WITH UNEQUAL PREDETECTION SIGNAL-TO-NOISE RATIOS

M. H. Brockman *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 170-188 refs (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 17B

Enhanced radio frequency carrier margin improvement for arrayed receiving systems for coherent reception which provides a significant carrier sensitivity improvement with a resultant decrease in telemetry radio loss due to reduction in rms phase noise at low carrier margins is discussed. A significant increase in doppler rate capability is realized relative to that obtained by switching to a narrower tracking loop bandwidth to obtain the same carrier sensitivity improvement. The situation for arrayed receiving systems with unequal apertures and statisically independent predetection noise is examined. E.A.K.

N84-19638*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

OPTIMUM CYCLIC REDUNDANCY CODES FOR NOISIER CHANNELS

P. Merkey and E. C. Posner *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 189-195 refs (For primary document see N84-19621 10-32)

Avail: NTIS HC A10/MF A01 CSCL 17B

Binary cyclic redundancy codes for feedback communication over noisy digital links are considered. The standard 16 bit American Data and Computer Communication Protocol (ADCCP) polynomial is designed for digital links which already have a low input bit error probability. For file transfer between personal computers over

telephone circuits, the quality of resulting digital circuit may be much lower. The 3 byte (24 bit) and 4 byte (32 bit) polynomials are considered. Generator polynomials of a certain class have minimum weight and yet achieve the bound on minimum distance for arbitrary codes. Particular choices for 24 bit and 32 bit redundancies are exhibited: of weight and distance 6 in the 24-bit case; and weight 10 and distance 8 in the 32-bit case. E.A.K.

N84-19639*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SETI INVESTIGATIONS AT JODRELL BANK, ENGLAND: SEPTEMBER THROUGH NOVEMBER 1983 c55
G. S. Downs and S. Gulkis *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 196-205 ref (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 22A

The radiofrequency interference RFI environment was examined in the frequency band 1404 to 1444 MHz using the DSN Advanced Systems' Radio Frequency Interference Surveillance System. An uncooled FET amplifier was placed on the 12.8-m antenna, and unlimited observing time was made available to the SETI project. One night of observing at 1667 MHz was made available on the 76 m antenna. Preliminary results of four investigations are reported: (1) full scans of the horizon, cataloging RFI events between 1404 and 1444 MHz; (2) lunar reflections of terrestrial RFI signals between 1424 and 1444 MHz; (3) noise background distortions caused by galactic neutral hydrogen emission at 1420.4 MHz; and (4) low sensitivity search for spectral features of F, G, and K stars. E.A.K.

N84-19640*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BROADCASTING SATELLITES AT 12 GHz FOR REGION 2: TECHNICAL CHARACTERISTICS
Edward F. Miller Feb. 1984 23 p refs Presented at IEEE's GLOBECOM, San Diego, Calif., 29 Nov. - 1 Dec. 1983
(NASA-TM-83522; E-1834; NAS 1.15:83522) Avail: NTIS HC A02/MF A01 CSCL 17B

Technical parameters such as satellite antenna characteristics, Earth station requirements, bandwidths, channelization, and allowable carrier-to-interference ratios are discussed. An overview of the downlink plan is given, including a histogram of the transmitter power requirements. The plan includes satellite orbit positions, spacecraft transmitted powers, antennas beam sizes, channel assignments, and polarizations. Author

N84-19641*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RURAL LAND MOBILE RADIO MARKET ASSESSMENT AND SATELLITE AND TERRESTRIAL SYSTEM CONCEPTS
Steven M. Stevenson and Charles E. Provencher 1984 29 p refs Presented at the 10th Communications Satellite Systems Conf., Orlando, Fla., 18-22 Mar. 1984
(NASA-TM-83591; E-1990; NAS 1.15:83591) Avail: NTIS HC A03/MF A01 CSCL 17B

Market potential exists; the nature of the market in terms of service needs, usage characteristics, service requirements, and forecasting the demand to the year 2000; alternative system concepts that show promise in addressing the identified needs, in a cost effective manner; and advanced technology requirements associated with these concepts are considered. Author

N84-19642# Fondazione Ugo Bordoni, Rome (Italy).
LAND MOBILE RADIO SERVICES: ACTS OF THE 2ND CONVENTION [ATTI DEL 2ND CONV.: SERVIZIO RADIOMOBILI TERRESTRI]
Jun. 1983 165 p refs Partly in ENGLISH and ITALIAN Proc. held in Pontecchio Marconi, Italy, 30 Jun-1 Jul. 1983, Sponsored by Fondazione Ugo Bordoni, Fondazione Guglielmo Marconi, and Bologna University
(FUB-7-1983) Avail: NTIS HC A08/MF A01

Field strength predictions, frequency management, geographical data bases, computer simulations, isofrequency multiaccess networks, development prospects, equipment design, and interference effects were discussed. For individual titles, see N84-19643 through N84-19659.

N84-19643# Joint Radio Committee of the Nationalised Power Industries, London (England).
FIELD STRENGTH PREDICTIONS USING A COMPUTER AND A TERRAIN DATA BASE
C. E. Dadson *In* Fondazione Ugo Bordoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 3-9 refs (For primary document see N84-19642 10-32)
Avail: NTIS HC A08/MF A01

The SERV computer program in which from stored topographical data, the ground profile along the radial from the transmitter to a chosen receiver location is reconstructed, and the path attenuation to be expected along this profile is evaluated, is presented. Each map is divided into 500 m squares, and each square is represented by a single height. The prediction method was tested on data from heavily built up areas at 168, 455 and 900 MHz. It is found that predictions are always optimistic by 35 to 42 dB. It is shown that the inclusion of a clutter factor produces calculations of signal levels very close to measured values. Author (ESA)

N84-19644# Deutsche Bundespost, Darmstadt (West Germany). Forschungsinst.
FIELD STRENGTH PREDICTION WITH A TOPOGRAPHICAL DATA BASE: EXPERIENCE GAINED IN THE FEDERAL REPUBLIC OF GERMANY
R. W. Lorenz *In* Fondazione Ugo Bordoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 10-17 refs (For primary document see N84-19642 10-32)
Avail: NTIS HC A08/MF A01

A topographical data base for field strength prediction, organized in area elements with a size of 5 x 5 km is described. The data stored for each area element are the maximum height above sea level and one of 10 figures describing the land morphology. The propagation prediction model is based on the empiriral correction factors and correction factors based on a large number of mobile measurements in the 450 MHz band which can be correlated with information stored in the data base. Measurement and prediction were compared, finding rather small mean errors. In small areas, however, the prediction errors may be large. Author (ESA)

N84-19645# Directorate of Radio Technology, London (England).
FREQUENCY MANAGEMENT IN THE UNITED KINGDOM FOR PRIVATE MOBILE RADIO SYSTEMS
R. M. Skiffins *In* Fondazione Ugo Bordoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 18-30 refs (For primary document see N84-19642 10-32)
Avail: NTIS HC A08/MF A01

The use of computer techniques to obtain a more efficient and equitable use of radio mobile systems in the United Kingdom is discussed. An automated frequency assignment and licensing system which will be operational in 1984 is described. Grade of service, frequency limitations, channel loading, assignment of exclusive two-frequency channels and computation of propagation prediction are discussed. A computer configuration for automated licensing based on the Perkin Elmer 3252 processor is detailed. Author (ESA)

N84-19646# Bologna Univ. (Italy). Dipt. di Elettronica, Informatica e Sistemistica.
GEOGRAPHIC OPERATORS FOR MANAGEMENT OF A DATA BASE FOR FREQUENCY PLANNING [OPERATORI GEOGRAFICI ORIENTATI ALLA GESTIONE DI UNA BASE DI DATA PER LA PIANIFICAZION DELLE FREQUENZE]
F. Bonfatti, S. Bonora (Fondazione Guglielmo Marconi, Pontecchio Marconi, Italy), L. Cavazza (CNR, Bologna), and G. Falciasecca *In* Fondazione Ugo Bordoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 31-53 refs In ITALIAN (For primary document see N84-19642 10-32)

Avail: NTIS HC A08/MF A01

The structure of a geographic data base system based on a set of operators which allows an efficient man-machine interaction is discussed. The proposed system approaches the theoretical limit of two bytes for coding the points of a geographic network. Data processing is accomplished by repeating elementary operations on each of the surface elements composing the area of interest, and integrating the results using simple geographic operators. The operators for extraction, incorporation and selection of data are described. It is shown that a simple combination of geographic functions allows the efficient management of a data base with the described structure. Author (ESA)

N84-19647# Centro Studi e Laboratori Telecomunicazioni, Turin (Italy).

COMPUTERIZED SIMULATION OF MULTIPATH FADING FOR MOBILE RADIO SYSTEMS [SIMULAZIONE AL CALCOLATORE DI AFFIEVOLIMENTI DA CAMMINI MULTIPLI PER RADIO-MOBILE]

E. Damosso and L. Stola *In* Fondazione Ugo Bordoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 54-61 refs In ITALIAN (For primary document see N84-19642 10-32)

Avail: NTIS HC A08/MF A01

The simulation of fading in a mobile radio system in urban areas is described. The technique is useful for evaluating the performance of systems and equipment which depend on propagation conditions. A computer program in BASIC adapted to a disk computer is described. The program simulates the time function of the received signal intensity. It is shown that the predicted signal keeps the dynamic and statistical characteristics of either the predictions made in several published models or the measured values. Author (ESA)

N84-19648# Ente Nazionale per l'Energia Elettrica, Rome (Italy).

IMPROVING FREQUENCY UTILIZATION EFFICIENCY IN TIME AND SPACE WITH ISOFREQUENCY MULTIPLE ACCESS NETWORKS IN PRIVATE SYSTEMS OF CELLULAR TYPE [IL MIGLIORAMENTO DELL'EFFICIENZA NELL'USO DELLE FREQUENZE NEL TEMPO E NELLO SPAZIO CON RETI MULTIACCESSO ISOFREQUENZIALI NEI SISTEMI CELLULARI DI TIPO PRIVATO]

Enrico Pace *In* Fondazione Ugo Bordoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 62-70 In ITALIAN (For primary document see N84-19642 10-32)

Avail: NTIS HC A08/MF A01

The optimization of cell dimensions to minimize the number of channels covering a given area in multichannel and multiaccess networks is studied. The optimum cell dimension is such that several isofrequency base stations are required. In this case internal network communications must be of synchronous simulcast type. The analysis of the examples shows that the efficiency of such a system is several times better than a monochannel system. A mobile radio system could be improved by 500%. Author (ESA)

N84-19649# Societa Italiana per l'Esercizio Telefonico, Rome (Italy).

EVOLUTION OF PUBLIC LAND MOBILE TELEPHONE SYSTEMS IN EUROPE

R. Failli *In* Fondazione Ugo Bornoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 71-80 refs (For primary document see N84-19642 10-32)

Avail: NTIS HC A08/MF A01

Public land mobile systems in service or planned in Europe, and the requirements and characteristics envisaged for the European Mobile Communication System are described. These include use of the 900 MHz band mobile stations in all participating countries, public services and data networks, no significant modification of the fixed telephone networks, and an internationally standardized signalling system for the interconnection of the mobile switching centers. Author (ESA)

N84-19650# Fondazione Ugo Bordoni, Rome (Italy).

DEVELOPMENT PROSPECTS FOR LAND MOBILE RADIO SYSTEMS IN ITALY [PROSPETTIVE DI SVILUPPO PER I SERVIZI RADIOMOBILI TERRESTRI IN ITALIA]

A. DellOvo (Ministero P.t.) *In its* Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 81-88 In ITALIAN (For primary document see N84-19642 10-32)

Avail: NTIS HC A08/MF A01

Frequency spectrum occupation and the prospects for short and long term development of land radio mobile systems are described. National planning of frequency distribution is discussed. Regulations concerning the optimization of the spectrum utilization in Italy are commented on. Author (ESA)

N84-19651# Societa Italiana per l'Esercizio Telefonico, Rome (Italy).

DEVELOPMENT OF THE PUBLIC MOBILE RADIO SERVICES IN ITALY [SVILUPPO DEL SERVIZIO RADIOMOBILE PUBBLICO DI CONVERSAZIONE IN ITALIA]

R. Failli *In* Fondazione Ugo Bordoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 89-96 refs In ITALIAN (For primary document see N84-19642 10-32)

Avail: NTIS HC A08/MF A01

The need to adopt second mobile radio generation systems is examined. The experimental programs of the future system are described. Problems concerning the transition phase in which both systems coexist are discussed. The second generation 450 MHz system is assumed to start operation by 1984 and to last till about 1995 when it will be replaced by the 900 MHz European mobile radio system. Author (ESA)

N84-19652# Fondazione Ugo Bordoni, Rome (Italy).

THE MOBILE RADIO SERVICE IN THE INTEGRATED NETWORK [IL SERVIZIO RADIOMOBILE NELLE RETE INTEGRATA]

A. Como (Fatme S.p.A.) *In its* Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 97-108 In ITALIAN (For primary document see N84-19642 10-32)

Avail: NTIS HC A08/MF A01

The characteristics of the AXE 10 commutation system, and those of the Mobile Telephony Subsystem are described. The system permits the integration of the mobile radio communications in the telephonic network. The radio cells have a minimum dimension of 16 sq km. The main functions that make possible the integration of mobile systems in the telephonic network are the hands off function which controls the quality of the transmission by means of a signal feedback from the mobile station and assures the commutation to the cell station with better signal to noise ratio, and the roaming function assuring the arrival of communication for whatever location of the mobile system. The growing diffusion of the AXE system in Europe is discussed. Author (ESA)

N84-19653# Ente Nazionale per l'Energia Elettrica, Rome (Italy).

THE RIAM PROJECT [IL PROGRETTO RIAM]

Enrico Pace *In* Fondazione Ugo Bordoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 109-117 In ITALIAN (For primary document see N84-19642 10-32)

Avail: NTIS HC A08/MF A01

A project for radio mobile networks characterized by isofrequency transmission and multiple access, used either for voice communication, telecontrol or telesignaling, is described. The system is designed for the operation and maintenance of the Italian electrical network. The necessity of such a project is discussed, comparing the present mobile radio system performance with that of other countries. A pilot network is installed for testing technical parameters. Author (ESA)

N84-19654# Fondazione Ugo Bordoni, Rome (Italy).

MULTIPLE ACCESS MOBILE RADIO SYSTEMS FOR PRIVATE NETWORKS [SISTEMA RADIOMOBILE AD ACCESSO MULTIPLO PER RETI PRIVATE]

G. Naldi (O.T.E. SI.EL SpA, Florence) *In its* Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 118-126 In ITALIAN (For primary document see N84-19642 10-32)

Avail: NTIS HC A08/MF A01

A multiple access network design is described. The transmitter-

receiver used in the radio central as well as those of the mobile units use advanced techniques of frequency synthesis and multifrequency signaling managed by microprocessors. The central equipment does not require commutation matrices. Each radio unit works on a fixed channel. It is shown that the automatic assignment of free channels permits more traffic than with traditional solutions. Author (ESA)

N84-19655# Fondazione Ugo Bordoni, Rome (Italy).
DATA TRANSMISSION AT 1200 BAUD IN MOBILE OR FIXED RADIO LINKS WITH INTERCHANNEL INTERFERENCES [TRASMISSIONE DATI A 1200 BAUD SU COLLEGAMENTI RADIOTELEFONICI MOBILI O FISSI IN CONDIZIONI DI INTERFERENZA CO-CANALE]
A. Colomonico (Italtel SIT) and A. Pegoretti (Italtel SIT) *In its* Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 127-136 refs In ITALIAN (For primary document see N84-19642 10-32)
Avail: NTIS HC A08/MF A01

Data transmission system design for isofrequency networks with FM equipment and 25 KHz channel separation is analyzed assuming Rayleigh fading and interchannel interference. The fast frequency shift modulation is found to give the best low frequency spectrum spread, with lower amplitude and phase distortion. For error correction, a cyclic recurrent code where the redundancy bits are interposed between information bits is chosen. The code is characterized by the maximum correctable error packet length and the guard between successive packets. The best performance is found for a code of type three which corrects packets of 6 errors with a guard of 19 bits. This design was tested in laboratory, showing the advantage of a coherent modulation and the positive effects of the code. Author (ESA)

N84-19656# Fondazione Ugo Bordoni, Rome (Italy).
DESIGN OF RECEIVER TRANSMITTERS FOR USE IN MULTIPLE ACCESS NETWORKS [PROGETTAZIONE DI RICETRASMETTITORI SINTETIZZATI IN RETI AD ACCESSO MULTIPLO]
P. Antonelli and L. Cilli *In its* Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 136-144 refs In ITALIAN (For primary document see N84-19642 10-32)
Avail: NTIS HC A08/MF A01

The design of frequency synthetizers is discussed. The influence of the spectrum characteristics of the local oscillation on the receiver selectivity, including the effects of spurious signals and phase noise, is analyzed. The dependence of receiver intermodulation attenuation on the spectrum of the local oscillator is also examined. The study of the synthesizer transfer function shows that to minimize phase noise a second order active filter may be placed after the loop filter with a cut-off frequency of at least 10 times the natural frequency of the loop. Separation of the voltage controlled oscillator from the modulation using multiloop synthesizers is advantageous. Author (ESA)

N84-19657# Ente Nazionale per l'Energia Elettrica, Rome (Italy). Servizio Teletrasmissioni.
EXPERIMENTAL MEASUREMENTS OF TRAFFIC AND RADIO DISTURBANCES IN ENTE NAZIONALE PER L'ENERGIA ELETTRICA'S (ENEL) MOBILE RADIO NETWORKS [RILIEVI SPERIMENTALI DI TRAFFICO E DI RADIO DISTURBI IN RETI RADIOMOBILI DELL'ENEL]
A. Farinetti and A. Manin *In* Fondazione Ugo Bordoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 145-152 refs In ITALIAN (For primary document see N84-19642 10-32)
Avail: NTIS HC A08/MF A01

To help redesign the Italian national communication network, a telephone traffic analyzer was implemented using a 8086 microprocessor. Results show that the peak load is double the average load in working hours; that the average peak load is 0.115 Erlang for each network; and that the average conversation length is 19 sec. Electromagnetic disturbances were measured in 50 Italian localities, finding and average reduction of receiver sensibility of 11 dB at 450 MHz and 24 dB at 160 MHz in urban areas with a high noise level. Author (ESA)

N84-19658# Istituto Superiore delle Poste e delle Telecomunicazioni, Rome (Italy).
CORDLESS TELEPHONE: A NEW DEGREE OF FREEDOM FOR THE TELEPHONE USER
G. Valentino *In* Fondazione Ugo Bordoni Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 153-155 In ITALIAN (For primary document see N84-19642 10-32)
Avail: NTIS HC A08/MF A01

The principles of a technical norm concerning cordless telephones are discussed. Goals include protection against frauding on bills by an identification code, rational use of the available radiofrequency spectrum and minimizing interferences with other communication services. Author (ESA)

N84-19659# Fondazione Ugo Bordoni, Rome (Italy).
EXPERIMENTAL EVALUATION OF THE INTERFERENCE OF A FREQUENCY HOPPING SIGNAL ON A TELEVISION SIGNAL [VALUTAZIONI SPERIMENTALI DELL'INTERFERENZA DI UN SEGNALE A FREQUENCY-HOPPING SU UN SEGNALE TELEVISIVO]
A. Basigli, M. Frullone, and V. Tizzani *In its* Land Mobile Radio Services: Acts of the 2nd Conv. Jun. 1983 p 150-163 refs In ITALIAN (For primary document see N84-19642 10-32)
Avail: NTIS HC A08/MF A01

The possibility of coexistance of frequency hopping (FH) and television signals was investigated. It is recognized that spread spectrum signals must produce less interference given the low power spectrum density. A theoretical analysis shows that the synchronism signals should resist FH disturbances better than the video signal. Tests with an FH signal synthesized in the 170 to 190 MHz band show that the advantages obtained with an FH system having a time threshold $>$ 20 msec do not justify the larger complexity, but it is suggested that faster FH systems could offer considerable improvements. Author (ESA)

N84-19660# Illinois Univ., Urbana. Electromagnetics Lab.
COUPLING BETWEEN 2 ARBITRARILY ORIENTED DIPOLES THROUGH MULTILAYERED SHIELDS
R. Yang and R. Mittra Jun. 1983 41 p
(Contract N00014-81-K-0245)
(AD-A137129; UIEM-83-7; UILU-ENG-83-2546) Avail: NTIS HC A03/MF A01 CSCL 20/3

An analysis of the electromagnetic coupling between two arbitrarily oriented dipoles through planar multilayered shields is made. This method of approach is based on the plane wave spectral representation of radiation fields and the use of transformation matrices for multilayered media. Numerical results are found to be in good agreement with the experimental data obtained in the frequency range from 10 kHz to 1 MHz. Author (GRA)

N84-19661# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DESIGN OF MICROWAVE BEAM-SWITCHING NETWORKS Technical Report
M. L. Burrows 5 Dec. 1983 81 p
(Contract F19628-80-C-0002; AF Proj. 2029; AF Proj. 6430)
(AD-A137240; TR-639; ESD-TR-83-049) Avail: NTIS HC A05/MF A01 CSCL 17/2

An investigation of RF beam-switching networks for creating, with a multiple-beam antenna (MBA), a set of electronically steerable antenna beams, shows that there are three main classes of network. Taking the case of a 61-beam MBA with 8 simultaneously steered beams as an example, we can describe these classes as: (1) networks which can connect any one of the 8 output ports to any one of the 61 beam feeds, (2) networks which can connect the 8 output ports to any set of 8 beam feeds selected from the 61, but with a constraint imposed on the order in which the 8 ports are connected to the 8 selected feeds, and (3) networks in which the set of 8 beam feeds cannot be selected arbitrarily - some fraction of the total number of conceivable interconnections cannot be completed. Networks exist in each of the three classes

having very similar traffic handling performance and yet requiring a total number of switches which is very different from one class to the next. Their number is 907, 387, and 175 for the unconstrained, order-constrained and selection-constrained networks, respectively, needed to do the 61-to-8 switching job described above. The report examines the design, performance and complexity of such networks for general N and M. Included are two further measures of complexity, as well as the switching algorithm and the effect of non-uniform traffic. The results are presented as graphs, tables and formulas. Author (GRA)

N84-19662# Naval Research Lab., Washington, D. C. Plasma Physics Div.
NEW HIGH POWER COHERENT RADIATION SOURCES Interim Report
P. Sprangle and T. Coffey 9 Jan. 1984 48 p
(RR01109)
(AD-A137317; AD-E500606; NRL-MR-5224) Avail: NTIS HC A03/MF A01 CSCL 20/3

In recent years, there has been considerable renewed interest in the development of novel devices for the production of high power coherent electromagnetic radiation. This interest has been motivated largely by the realization that, with existing technology, certain processes utilizing relativistic electron beams can produce coherent electromagnetic radiation at power levels far in excess of those achieved by conventional electron devices. This paper will review the current status of this rapidly developing field, with emphasis on two generic devices. The major thrust in the recent development of electron beam driven radiation sources has been directed towards achieving shorter wavelengths, greater power and higher efficiencies. Shortly after the development of such successful sources as the magnetron, kylstron and various traveling wave devices, it became clear that, in their original form, they were limited in their ability to produce high levels of radiation efficiently at short wavelengths. To circumvent the inherent limitations of these conventional coherent radiation sources, many new concepts and mechanisms, as well as variations on conventional concepts, were proposed. This paper is concerned primarily with two devices which are, relatively speaking, newcomers to the list of coherent classical radiation sources. They are the free electron laser and the cyclotron resonance maser (CRM); one well known type of CRM is the gyrotron. GRA

N84-19663# Royal Military Coll. of Science, Shrivenham (England).
INVESTIGATION OF NEW CONCEPTS FOR DESIGNING MILLIMETRE-WAVE ANTENNAS Final Technical Report, Jun. 1980 - Sep. 1983
J. R. James and C. M. Hall Sep. 1983 89 p
(Contract DAJA37-80-C-0183; DA Proj. 1T1-61102-BH-57)
(AD-A137350) Avail: NTIS HC A05/MF A01 CSCL 09/5

The problem associated with the design of microstrip antennas and arrays at millimeter wavelengths is addressed and the dominant difficulties identified as line loss, tolerance effects and integration or connection of the antenna to the rest of the equipment using launching transitions. Several types of the latter are evaluated and measured to illustrate loss and cross-polarization effects. Methods for reducing line loss are investigated but the reductions are not significant. The findings are summarized and related to current military requirements. An alternative structure, and hybrid microstrip dielectric array is described and in principle enables array feeder loss to be appreciably reduced but launcher loss remains the major obstacle. Conclusions and recommendations are given and it is evident that microstrip continues to be attractive for some military applications where planar conformal smaller size arrays are required. Author (GRA)

N84-19664# Lincoln Lab., Mass. Inst. of Tech., Lexington.
NUMERICAL SOLUTIONS TO ILL-POSED AND WELL-POSED IMPEDANCE BOUNDARY CONDITION INTEGRAL EQUATIONS
James R. Rogers 30 Nov. 1983 98 p
(Contract F19628-80-C-0002)
(AD-A137353; TR-641; ESD-TR-83-106) Avail: NTIS HC A05/MF A01 CSCL 12/1

Exterior scattering from a three-dimensional impedance body can be formulated in terms of various integral equations derived from the Leontovich impedance boundary condition (IBC). The electric and magnetic field integral equations are ill-posed because they theoretically admit spurious solutions at the frequencies of interior perfect conductor cavity resonances. A combined field formulation is well-posed because it does not allow the spurious solutions. This report outlines the derivation of IBC integral equations and describes a procedure for constructing moment-method solutions for bodies of revolution. Numerical results for scattering from impedance spheres are presented which contrast the stability and accuracy of solutions to the ill-posed equations with those of the well-posed equation. The results show that numerical solutions for exterior scattering to the electric and magnetic field integral equations can be severely contaminated by spurious resonant solutions regardless of whether the surface impedance of the body is lossy or lossless. GRA

N84-19665# Technion - Israel Inst. of Tech., Haifa. Dept. of Physics.
EMISSION AND TRANSMISSION OF ATMOSPHERIC RADIATION AND THEIR INFLUENCE ON THE PERFORMANCE OF ELECTRO-OPTICS SYSTEMS MEASUREMENT, ANALYSIS AND MODELLING Final Technical Report, Jun. 1982 - Mar. 1983
Ami Ben-Shalom Sep. 1983 72 p
(Contract DAJA37-81-C-0504; DA Proj. 1T1-61102-BH-57)
(AD-A137359; AD-F050087) Avail: NTIS HC A04/MF A01 CSCL 20/4

Measurements were made at visible, infrared (IR) and near millimeter wave (NMMW) wavelengths to determine the effect of various atmospheric conditions including those containing artificially generated dust, on transmission. Results from these tests indicate little or no attenuation at NMMW frequencies (96 GHz, 140 GHz, 220 GHz), while there were appreciable transmittance losses at visible (0.4 - 1.1 um) and IR (3.0 - 5.5 um, 8.0 - 13.0 um) wavelengths. Analysis of the visible and IR transmittance data obtained through vehicle-generated dust clouds indicated a spectral dependency after the fallout of the heavier particles. Extinction coefficients were calculated for each of the bandwidths. The ratio between the IR, NMMW, and visible wavelengths were 0.86 for 3.0 - 5.5 um, 0.78 for 8.0 - 13.0 um, and less than 0.003 for 96 GHz, 140 GHz and 220 GHz. Author (GRA)

N84-19666# Naval Underwater Systems Center, New London, Conn. Submarine Electromagnetic Systems Dept.
CONNECTICUT ELF (EXTREMELY LOW FREQUENCY) FIELD STRENGTH MEASUREMENTS, MARCH TO MAY 1978 Technical Report
Peter R. Bannister 11 Jan. 1984 74 p
(AD-A137385; NUSC-TR-7079) Avail: NTIS HC A04/MF A01 CSCL 20/14

From August 1976 to December 1978, extremely low frequency (ELF) field-strength measurements were taken continuously in Connecticut. The results of measurements taken from March through May 1978 are discussed in this report. During March, 5 dB, or greater, nighttime signal fades occurred during 46 percent of the measurement days. A comparison of the normal and abnormal Connecticut horizontal magnetic-field strengths during distributed propagation conditions revealed atypical behavior. Field-strength measurements were also taken before, during, and after the 29 April PCA event (9.8 dB riometer absorption). GRA

N84-19667# Battelle Columbus Labs., Ohio.
DETECTION OF ELECTROMAGNETIC RADIATION LEAKAGE THROUGH SMALL STRUCTURAL OPENINGS Final Report, 10 Aug. 1982 - 30 Sep. 1983
John R. Birchmeier, J. G. Meadors, and K. A. Shubert 30 Sep. 1983 156 p
(Contract MDA903-82-C-0398; ARPA Order 4576)
(AD-A137407) Avail: NTIS HC A08/MF A01 CSCL 20/3

The successful detection of small structural openings was demonstrated using electromagnetic fields to probe an unknown crack structure. Using EM fields, with frequency components from

2 GHz to 18 GHz, crack dimensions as small as 0.020 inch were detected. This resolution was limited by the data acquisition system and the mechanical tolerances of the test structure. With higher test frequencies and better measurement hardware this resolution should be improved. The crack detection was accomplished using time-domain reflectometry and frequency-domain analysis. The best measured resolution to date was obtained with frequency-domain continuous wave techniques. GRA

N84-19668# Naval Underwater Systems Center, New London, Conn. Submarine Electromagnetic Systems Dept.
CONNECTICUT ELF (EXTREMELY LOW FREQUENCY) FIELD MEASUREMENTS, MAY TO JULY 1977 Technical Report
Peter R. Bannister 11 Jan. 1984 100 p
(NR Proj. X07-92)
(AD-A137416; NUSC/TR-6887) Avail: NTIS HC A05/MF A01 CSCL 17/2

From August 1976 to December 1978, extremely low frequency (ELF) field-strength and effective-noise measurements were taken continuously in Connecticut. The results of measurements taken from May through July 1977 are discussed in this report. The principal result is that for the 1-yr period of August 1976 to July 1977 amplitude peak-to-trough variations of 5 dB, or greater, were observed 26 percent of the time. Author (GRA)

N84-19669# BDM Corp., Albuquerque, N. Mex.
GENERAL ELECTROMAGNETIC MODEL FOR THE ANALYSIS OF COMPLEX SYSTEMS (GEMACS) USER MANUAL (VERSION 3), VOLUME 1 Final Technical Report, Feb. 1981 - Jul. 1983
D. L. Kadlec and E. L. Coffey Griffiss AFB, N.Y. RADC Sep. 1983 117 p
(Contract F30602-81-C-0084; AF Proj. 2338)
(AD-A137461; BDM/A-83-170-TR; RADC-TR-83-217-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 20/14

GEMACS solves electromagnetic radiation and scattering problems. The Method of Moments (MOM) and Geometrical Theory of Diffraction (GTD) are used. MOM is formalized with the Electric Field Integral Equation (EFIE) for wires and the Magnetic Field Integral Equation (MFIE) for patches. The code employs both full matrix decomposition and Banded Matrix Iteration (BMI) solution techniques. The MOM, GTD and hybrid MOM/GTD techniques in the code are used to solve electrically small object problems, electrically large object problems and combination sized object problems. Volume I of this report is the User Manual. The code execution requirements, input language and output are discussed. GRA

N84-19670# BDM Corp., Albuquerque, N. Mex.
GENERAL ELECTROMAGNETIC MODEL FOR THE ANALYSIS OF COMPLEX SYSTEMS (GEMACS) ENGINEERING MANUAL (VERSION 3), VOLUME 2 Final Technical Report, Feb. 1981 - Jul. 1983
D. L. Kadlec and E. L. Coffey Griffiss AFB, N.Y. RADC Sep. 1983 221 p
(Contract F30602-81-C-0084; AF Proj. 2338)
(AD-A137462; BDM/A-83-172-TR; RADC-TR-83-217-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 20/14

GEMACS solves electromagnetic radiation and scattering problems. The Method of Moments (MOM) and Geometrical Theory of Diffraction (GTD) are used. MOM is formalized with the Electric Field Integral Equation (EFIE) for wires and the Magnetic Field Integral Equation (MFIE) for patches. The code employs both full matrix decomposition and Banded Matrix Iteration (BMI) solution techniques. The MOM, GTD and hybrid MOM/GTD techniques in the code are used to solve electrically small object problems, electrically large object problems and combination sized object problems. Volume II is the Engineering Manual. The theory and engineering approximations implemented in the code are discussed. Modeling criterion are given. GRA

N84-19671# BDM Corp., Albuquerque, N. Mex.
GENERAL ELECTROMAGNETIC MODEL FOR THE ANALYSIS OF COMPLEX SYSTEMS (GEMACS) ENGINEERING MANUAL (VERSION 3), VOLUME 3 Final Technical Report, Feb. 1981 - Jul. 1983
D. L. Kadlec and E. L. Coffey Griffiss AFB, N.Y. RADC Sep. 1983 424 p
(Contract F30602-81-C-0084; AF Proj. 2338)
(AD-A137463; BDM/A-83-020-TR; RADC-TR-83-217-Vol-3) Avail: NTIS HC A18/MF A01 CSCL 20/14

GEMACS solves electromagnetic radiation and scattering problems. The Method of Moments (MOM) and Geometrical Theory of Diffraction (GTD) are used. MOM is formalized with the Electric Field Integral Equation (EFIE) for wires and the Magnetic Field Integral Equation (MFIE) for patches. The code employs both full matrix decomposition and Banded Matrix Iteration (BMI) solution techniques. The MOM, GTD and hybrid MOM/GTD techniques in the code are used to solve electrically small object problems, electrically large object problems and combination sized object problems. Volume III is the Computer Code Documentation Manual. This manual contains extensive software information of the code. GRA

N84-19672# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
DISTRIBUTED OPTIMIZATION ALGORITHMS WITH COMMUNICATIONS
J. Tsitsiklis and M. Athans Nov. 1983 4 p
(Contract N00014-77-C-0532)
(AD-A137476; LIDS-P-1344) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document discusses the convergence properties of asynchronous distributed iterative optimization algorithms, tolerating communication delays. The authors focus on a gradient-type algorithm for minimizing an additive cost function and present sufficient conditions for convergence. They view such an algorithm as a model of adjustment of the decisions of decision makers in an organization and we suggest that our results can be interpreted as guidelines for designing the information flows in an organization. Author (GRA)

N84-19673# BDM Corp., Albuquerque, N. Mex.
GENERAL ELECTROMAGNETIC MODEL FOR THE ANALYSIS OF COMPLEX SYSTEMS (GEMACS) COMPUTER CODE DOCUMENTATION (VERSION 3), VOLUME 3, PART 3 Final Technical Report, Feb. 1981 - Jul. 1983
D. L. Kadlec and E. L. Coffey Sep. 1983 445 p
(Contract F30602-81-C-0084; AF Proj. 2338)
(AD-A137509; BDM/A-83-020-TR-Vol-3-Pt-3;
RADC-TR-83-217-Vol-3-Pt-3) Avail: NTIS HC A19/MF A01 CSCL 20/14

GEMACS, the General Electromagnetic Model for the Analysis of Complex Systems solves electromagnetic radiation and scattering problem. The Method of Moments (MOM) and Geometrical Theory of Diffraction (GTD) are used. MOM is formalized with the Electric Field Integral Equation (EFIE) for wires and the Magnetic Field Integral Equation (MFIE) for patches. The code employ both full matrix decomposition and Banded Matrix Iteration (BMI) solution techniques. The MOM, GTD and hybrid MOM/GTD techniques in the code are used to solve electrically small object problems, electrically large object problems and combination sized object problems. The computer code documentation is given. R.J.F.

N84-19674# BDM Corp., Albuquerque, N. Mex.
GENERAL ELECTROMAGNETIC MODEL FOR THE ANALYSIS OF COMPLEX SYSTEMS (GEMACS) COMPUTER CODE DOCUMENTATION (VERSION 3), VOLUME 3, PART 4 Final Technical Report, Feb. 1981 - Jul. 1983
D. L. Kadlec and E. L. Coffey Sep. 1983 567 p
(Contract F30602-81-C-0084; AF Proj. 2338)
(AD-A137510; BDM/A-83-020-TR-Vol-3-Pt-4;
RADC-TR-83-217-Vol-3-Pt-4) Avail: NTIS HC A24/MF A01 CSCL 20/14

GEMACS, the General Electromagnetic Model for the Analysis of Complex systems, solves electromagnetic radiation and scattering problems. The Method of Moments (MOM) and Geometrical

Theory of Diffraction (GTD) are used. MOM is formalized with the Electric Field Integral Equation (EFIE) for wires and the Magnetic Field Integral Equation (MFIE) for patches. The code employs both full matrix decomposition and Banded Matrix Iteration (BMI) solution techniques. The MOM, GTD and hybrid MOM/GTD techniques in the code are used to solve electrically small object problems, electrically large object problems and combination sized object problems. A computer code documentation manual is given. The manual contains extensive software information of the code. R.J.F.

N84-19675# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
FUNDAMENTAL ISSUES OF MULTIPLE ACCESSING Ph.D. Thesis
Joseph Yu Ngai Hui Nov. 1983 230 p
(Contract N00014-75-C-1183; Grant NSF ECS-79-19880; ARPA Order 3045; NR Proj. 049-383)
(AD-A136676; LIDS-TH-1341) Avail: NTIS HC A11/MF A01 CSCL 17/2

Fundamental issues of multiple accessing are identified. These issues include transmitter asynchronism, variability of the set of active users, feedback, and degree of codebook knowledge among the users. Various multiple access schemes are examined under these issues. These issues are subsequently modeled and analysed using an information theoretic framework. We discover that the capacity region of the asynchronous multiple access channel is different from that of the synchronous channel. For communication systems with users having random message generation time, we demonstrate that its channel capacity resembles that of an asynchronous channel even though the users are synchronous, if decoding delay is constrained to be much smaller than the message inter-arrival time. We investigate communication with restricted decoder structure. New information theoretic quantities that incorporate the decoding metric used are discovered and examined. Using these quantities, we provide a rigorous and novel treatment for the theory of jamming. These mathematical techniques provide insight for achieving reliable communication in a multiple access environment where each user may not know the codebook of the other users and a jammer may be present. We then apply the general theory developed to three specific asynchronous channel without feedback, namely the OR channel, the spread spectrum channel and the collision channel. Practical and novel coding schemes are suggested. Maximum throughput, error rate and decoding complexity are analysed. Author (GRA)

N84-19676# Naval Postgraduate School, Monterey, Calif.
A LAYERED COMMUNICATION SYSTEM FOR ETHERNET M.S. Thesis
Mark D. Stotzer Sep. 1983 100 p
(AD-A136799) Avail: NTIS HC A05/MF A01 CSCL 17/2

Connecting heterogeneous computer systems via local area networks presents a challenge to software designers for the development of effective, reliable, and modifiable network communication software. This thesis presents a set of hierarchical program modules written for use on any INTELLEC MDS microcomputer development system, running the CP/M-80 operating system, to allow the system to become part of an Ethernet local area network. This program of software engineering reflects the same functional hierarchy as the International Standards Organization Open System Interconnection architectural reference model for computer networks. computer networks. Author (GRA)

N84-19677# Teledyne Brown Engineering, Huntsville, Ala.
RADOME ANALYSIS
T. S. Pendergrass Oct. 1983 45 p
(Contract DASG60-81-C-0109)
(AD-A136805; AD-E301284; SD83-BMDSCOM-2682) Avail: NTIS HC A03/MF A01 CSCL 17/9

This report documents the usage and applications of the Ray Trace Formulation Radome Analysis Computer Program (RTF-RACP) to the BMD ENNK Program. Methodology for applying the program to a generic millimeter wave radome is presented. Data is given to illustrate the effect of temperature, erosion, ablation and frequency variation on radome boresight error. Author (GRA)

N84-19678# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PROTOCOL SOFTWARE FOR A PACKET VOICE TERMINAL
C. K. McElwain 16 Nov. 1983 83 p
(Contract F19628-80-C-0002; DARPA Order 3673; AF Proj. 3D10; AF Proj. 3T10)
(AD-A136938; TR-663; ESD-TR-83-054) Avail: NTIS HC A05/MF A01 CSCL 17/2

A Packet Voice Terminal (PVT) has been developed at Lincoln Laboratory to provide voice access to an experimental wideband internetwork packet system. The PVT employs a modular, microprocessor-based structure to provide voice processing, packet voice protocol, and network interface functions. The packet voice protocols are implemented in software in the Protocol Processor (PP) module, which is the primary controlling module of the PVT and which handles interfaces to a voice processor, a network interface processor, and a user instrument. This report describes the software implemented in the Protocol Processor. The implementation of the Network Voice Protocol (NVP-II) and the Stream (ST) protocol are described. Call set-up functions for both point-to-point calls and conferencing, and the methods used for packetization and reconstitution of speech, are described. Problems encountered and solutions which have been implemented are discussed. Author (GRA)

N84-19679# Semcor, Inc., Farmingdale, N.J.
INTERFACE CONTROL DOCUMENT FOR AN/ARC-186 VHF-AM/FM RADIO
Dec. 1983 96 p
(Contract DAAB07-83-D-F058)
(AD-A136939; USAAVRADCOM-83E-13) Avail: NTIS HC A05/MF A01 CSCL 17/2

This document establishes the requirements for the transfer of all data between the AN/ARC-186 and the onboard aircraft systems. The primary mode of information transfer will be via a MIL-STD-1553B data bus. Author (GRA)

N84-19680# Raytheon Co., Goleta, Calif. Electromagnetic Systems Div.
ADAPTIVE CANCELLATION TECHNIQUES Final Report
21 Nov. 1983 129 p
(Contract N00014-81-C-2575)
(AD-A136946; AD-E001638) Avail: NTIS HC A07/MF A01 CSCL 17/4

An adaptive signal canceller has been evaluated for the enhancement of pulse signal reception during the transmission of a high power ECM jamming signal. The canceller design is based on the use of DRFM(Digital RF Memory) technology as part of an adaptive multiple tapped delay line. The study includes analysis of relationship of tap spacing and waveform bandwidth, survey of related documents in areas of sidelobe cancellers, transversal equalizers, and adaptive filters, and derivation of control equations and corresponding control processes. The simulation of overall processes included geometric analysis of the multibeam transmitting antenna, multiple reflection sources and the receiving antenna; waveforms, tap spacings and bandwidths; and alternate control algorithms. Conclusions are provided regarding practical system control algorithms, design characteristics and limitations. Author (GRA)

N84-19681# Semcor, Inc., Farmingdale, N.J.
INTERFACE CONTROL DOCUMENT FOR RT-XXXX/ARC-164 UHF-AM RADIO
Dec. 1983 101 p
(Contract DAAB07-83-D-F058)
(AD-A136970; USAAVRADCOM-83E-10) Avail: NTIS HC A06/MF A01 CSCL 17/2

This document establishes the requirements for the transfer of all data between the AN/ARC-164 and the onboard aircraft

systems. The primary mode of information transfer will be via a MIL-STD-1553B data bus. Author (GRA)

N84-19682# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
RESEARCH IN CONTINUOUS SPEECH RECOGNITION Annual Report, 1 Oct. 1982 - 30 Sep. 1983
Richard M. Schwartz, Yen-Lu Chow, and John Makhoul Dec. 1983 69 p
(Contract N00014-81-C-0738)
(AD-A136990; BBN-5485) Avail: NTIS HC A04/MF A01 CSCL 05/7

This annual report describes the work performed during the past year in an ongoing effort to design and implement a system that performs phonetic recognition of continuous speech. The general approach used it to develop a Hidden Markov Model (HMM) of speech parameter movements, which can be used to distinguish among the different phonemes. The resulting phoneme models incorporate the contextural effects of neighboring phonemes. One main aspect of this research is to incorporate both spectral parameters and acoustic-phonetic features into the HMM formalism. Author (GRA)

N84-19683# Mitre Corp., Bedford, Mass.
EFFECTIVE EARTH RADIUS FOR REFRACTION OF RADIO WAVES AT ALTITUDES ABOVE 1 km Final Report
G. A. Robertshaw Hanscom AFB, Mass. ESD Dec. 1983 41 p
(Contract F19628-82-C-0001)
(AD-A137095; MTR-8915; ESD-TR-83-219) Avail: NTIS HC A03/MF A01 CSCL 20/14

Atmospheric refractivity gradients are responsible for the bending of radio and microwave propagation paths such that the electromagnetic line-of-sight deviates from the geometrical line-of-sight. Such refraction effects must be accounted for when the performance of airborne surveillance radar systems is modelled. For propagation paths within 1 kilometer of the Earth's surface, the effective Earth radius model, which accounts for bending of rays by rescaling the Earth's radius, is normally valid and commonly used. In the present work, a ray trace method for determination of propagation paths in a semi-empirical stratified atmosphere is described. Results obtained from the ray trace model are employod to show that the effective Earth radius method can be used for approximate determinations of grazing angle, ground range, and slant range for higher altitude paths. Effective Earth radius scale factors are given as a function of transmitter altitude for selected values or surface refractivity. However, it must be emphasized that very accurate propagation prediction still requires detailed ray trace calculations in the context of accurate atmospheric models. Author (GRA)

N84-19684# Naval Ocean Systems Center, San Diego, Calif.
COMMENTS ON MEASURES OF PERFORMANCE OF SELECTED SIGNAL DETECTORS
D. E. Marsh 14 Jul. 1983 16 p
(AD-A137102) Avail: NTIS HC A02/MF A01 CSCL 17/2

This document discusses various measures of signal processor performance, their interrelationships, and the relationship between analytically and empirically derived performance models. It also presents the derivation of performance equations for a broadband coherent signal processors structured as a two channel device so as to allow study of correlated noise situations as well as of general correlation detectors beyond the constraints of matched filter or replica correlation schemes. Author (GRA)

N84-19685# Los Alamos Scientific Lab., N. Mex.
LOS ALAMOS REAL-TIME AND DIGITAL RADIOGRAPHY PLANS
R. D. Strong 1983 4 p Presented at the WANTO Meeting, Miamisburg, Ohio, 11-12 Oct. 1983
(Contract W-7405-eng-36)
(DE84-004327; LA-UR-83-3477; CONF-8310217) Avail: NTIS HC A02/MF A01

Real time radiography which is the conversion of the radiographic image into a video image for display on a TV monitor is discussed. Once the image is in video format it is easy to digitize it using one of several digitizing systems. When the image is digitized, digital signal processing may be performed on the image to enhance it or to assist the radiographer in interpreting. Digital processing may be performed in near real-time of off-line. DOE

N84-19686# Sandia Labs., Albuquerque, N. Mex.
SOME RECENT RESULTS IN WAVE PROPAGATION
Peter J. Chen 1983 8 p refs Presented at the Conf. on Waves and Stability in Continuous Media, Cosenza (Italy), 11 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE84-003107; CONF-8306141-1) Avail: NTIS HC A02/MF A01

The results concerning wave propagation which were obtained are described. Three particular areas concerning dynamic ferroelectricity, accurate shock amplitude computation and induced discontinuities, and observation of the existence of electrically excitable nonclassical mechanical resonances are reviewed. DOE

N84-19687# California Univ., Livermore. Lawrence Livermore Lab.
COMPUTER ASSESSMENT OF ELECTROMAGNETIC MEANS OF DETECTING APPROACHING CRUISE MISSILE
G. J. Burke, R. J. King, R. J. Lytle, and E. K. Miller Nov. 1983 20 p refs
(Contract W-7405-eng-48)
(DE84-005115; UCID-19925) Avail: NTIS HC A02/MF A01

Numerical modeling of beverage and monopole antennas shows that the fields of both antennas have a similar dependence on range and height above ground, with the beverage antenna having slightly greater gain in the forward direction due to its directivity. It is found that the use of multiple beverage antennas closely spaced increases the efficiency and gain in the forward direction for short beverage antennas. For the longer antenna considered for the cruise missile radar, the decrease in directivity for two closely spaced antennas reduced the forward gain. DOE

N84-19688# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
TELEVISION INTERFERENCE MEASUREMENTS NEAR THE MOD-2 WT ARRAY AT GOODNOE HILLS, WASHINGTON
D. L. Sengupta, T. B. A. Senior, and J. E. Ferris Nov. 1983 63 p refs
(Contract DE-AC02-83CH-10093)
(DE84-000030; SERI/STR-211-2086) Avail: NTIS HC A04/MF A01

Electromagnetic interference to television reception caused by the MOD-2 wind turbine (WT) array at Goodnoe Hills, Washington, was studied by means of detailed measurements at a number of test sites in the vicinity of the WT array. The commercial television signals available in the area were used as the radio frequency sources during the measurements. The dynamic measurements indicated that varying amounts of TVI were produced at all sites and on some or all of the available TV channels; with the directional antenna, in use, most of the backward region interference produced video distortion that was judged to be acceptable; at one test location about 1-1/2 miles from the WT array site, forward region interference was observed; when the blades of the WTs rotate in synchronism, the amplitude of the interference pulses increased, thereby producing more TVI effects; and when the blades do not rotate in synchronism, each WT produces interference effects individually. DOE

N84-19689# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Informatique.
BUS INTERCONNECTION IN MULTIPROCESSOR ENVIRONMENT: THE COMMUNICATION PRINCIPLE AND THE ARBITRATION TECHNIQUES Ph.D. Thesis [INTERCONNEXION PAR BUS EN ENVIRONNEMENT MULTIPROCESSOR: PRINCIPE DE COMMUNICATION ET TECHNIQUES D'ARBITRAGE]
Rene Joly 23 Jun. 1983 126 p refs In FRENCH
(ENST-E-83010) Avail: NTIS HC A07/MF A01

The structure and the algorithms of the arbiter function managing the data traffic in a multibus architecture are studied.

The arbitration algorithms such as daisy chaining, polling or independent request are reviewed. An arbitration algorithm is implemented to be used in the ARCADE multibus multiprocessor system. The bus system of ARCADE is described and an experimental model is implemented. The resulting system is more complex than originally estimated, leading to another approach which is outlined: a high rate multipurpose interconnection structure. Author (ESA)

N84-19690# Fondazione Ugo Bordoni, Rome (Italy).
SPEAKER RECOGNITION: EXAMPLE OF EXECUTION OF A PHONIC TEST [RICONOSCIMENTO DEL PARLATORE: ESEMPIO DI ESECUZIONE DI UNA PERIZIA FONICA]
Nicola Desario, Giovanni Ibba, Andrea Paoloni, Berado Saverione, and Antonio Federico Dec. 1982 151 p In ITALIAN
(FUB-55-1982) Avail: NTIS HC A08/MF A01

A phonic test carried out in realistic conditions was used to verify a speaker recognition method integrated by a semiautomatic recognition system validated by subjective hearing tests. A set of six telephone phonic samples were analyzed using standardized voice sample recordings of three speakers. Statistical computerized analysis reduced the samples from six to three, and permitted the identification of the corresponding speakers. A subjective test carried out by four specially trained analysts confirms the results. Author (ESA)

N84-19691# Fondazione Ugo Bordoni, Rome (Italy).
ANALYSIS OF RECEIVERS PROVIDED WITH EQUALIZERS FOR DIGITAL RADIO LINKS IN THE PRESENCE OF MULTIPATH FADING [ANALISI DI ALCUNI RICEVITORI CON EQUALIZZATORE PER PONTE RADIO NUMERICO IN PRESENZA DI FADING DA CAMMINI MULTIPLI]
Fabio Andreucci (DUNE S.R.L.) and Pier Giorgio Marchetti Dec. 1982 25 p refs In ITALIAN
(FUB-56-1982) Avail: NTIS HC A02/MF A01

Methods to evaluate the difference between a transversal equalizer and a decision feedback equalizer are discussed. The advantages of the feedback equalizer regarding the reduction of the intersymbolic interference and the tolerance to clock synchronism errors are noted. A design for the digital equalizer is suggested. Author (ESA)

N84-19692# Fondazione Ugo Bordoni, Rome (Italy).
ANALYSIS OF THE BEHAVIOR OF SOME TYPES OF SYNCHRONIZER FOR NUMERICAL RADIO LINKS IN THE PRESENCE OF ATMOSPHERIC MULTIPATH TRANSMISSION [ANALYSI DEL COMPORTAMENTO DI ALCUNI TIPI DI SINCRONIZZATORI PER RICEVITORI DI PONTI RADIO NUMERICI IN PRESENZA DI CAMMINI MULTIPLI ATMOSFERICI]
Fabio Andreucci (DUNE S.R.L.) and Pier Giorgio Marchetti Dec. 1982 42 p refs In ITALIAN
(FUB-57-1982) Avail: NTIS HC A03/MF A01

An analog synchronizer with a squaring device and a digital synchronizer capable of operating at a high transmission rate are compared. The test results show that in the presence of severe selective fading the analog device is better even if the time jitter is higher. Author (ESA)

N84-19693# Fondazione Ugo Bordoni, Rome (Italy).
ATTENUATION DATA BANK IN THE PROJECT COST 205: GENERATION, CONTROL, AND PRELIMINARY ANALYSIS [BANCA DATI DI ATTENUAZIONE NEL PROGETTO COST 205: GENERAZIONE, CONTROLLO ED ANALISI PRELIMINARI]
Aldo Paraboni (Politecnico di Milano) Mar. 1983 40 p ref In ITALIAN
(FUB-2-1983) Avail: NTIS HC A03/MF A01

The data acquisition responsibilities of members of the COST 205 project are reported. The final product will be a data bank in a computer memory as well as a magnetic tape recording of those data for exchange between researchers. The project is concerned with the rain attenuation in microwave transmission. Three lists are included in the data bank: the duration and gradient of rain events, days with rain and days with attenuation. The parameters to be measured during the transmissions from the SIRIO and OTS satellites are detailed. Author (ESA)

N84-19694# Fondazione Ugo Bordoni, Rome (Italy).
TEST METHODOLOGY FOR THE LEVEL TWO SUBSYSTEM OF AN X25 PROCEDURE FOR DATA TERMINAL EQUIPMENT [METODOLOGIA DI TEST PER IL SOTTOSISTEMA DI LIVELLO 2 DI UN DTE X.25]
Claudio Rossi, Paolo Talone, and Sebastiano Trigila Jan. 1983 32 p refs In ITALIAN
(FUB-3-1983) Avail: NTIS HC A03/MF A01

A communication network test methodology in accordance with the Italian public network protocol is discussed. The general principles are not valid for subsystems of order greater than two. The basic approach is an analysis by states, classifying the several states by criteria such as accessibility, observability and excitability. This method is capable of in depth verification of the system, although there may be problems concerning the complexity of the test. Author (ESA)

N84-19695# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
DETERMINISTIC AND RANDOM PHASE NOISE OF OSCILLATION
Helmut Bloetscher Jul. 1983 29 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-848)
(DFVLR-Mitt-83-11; ESA-TT-848) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 12

Quality requirements concerning the spectral purity of oscillators in synthetic aperture radar are estimated. Sinusoidal interference terms were generated in a Taylor series and square and cubic phase error influence were investigated. Square phase errors give rise to a spreading of the mains lobes of the azimuth shape, while cubic phase errors induce a displacement of the main lobe and an accentuation of the side lobe levels. Author (ESA)

N84-19696# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Lasertechnik.
PULSE HETERODYNE EQUIPMENT FOR MEASUREMENTS OF RANGE AND VELOCITY OF MOVING TARGETS
Friedrich Malota Mar. 1983 55 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-845)
(DFVLR-FB-83-18; ESA-TT-845) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 18,50

A pulse heterodyne equipment comprising a transmitter with pulse length of 300 nsec and a continuous wave local oscillator was developed. Angular sensitivity and frequency behavior measurements were carried out. About 100 rangefinding measurements were performed, and it is shown that the accuracy increases with higher intermediate frequencies. The influence of the velocity of moving targets was simulated by a rotary disk. Results show that this influence diminishes with higher intermediate frequencies. Author (ESA)

N84-19697# Norddeutsche Mende Rundfunk K.G., Bremen (West Germany).
SUPER 8 FILM SCANNING SET BY USING A CCD-LINE Final Report, Dec. 1981
Gerd Borntraeger Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 19 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-249; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 4

Super 8 film reproduction by color TV sets is discussed. The fitting of CCD-lines with color-filter or with other color dividing equipment failed, and the project was stopped. Author (ESA)

N84-19698# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
ON THE APPLICATION OF BIPHASE CODING IN DATA COMMUNICATION SYSTEMS
A. P. Verlijsdonk Dec. 1982 23 p refs
(EUT-82-E-132; ISBN-90-6144-132-3; ISSN-0167-9708) Avail: NTIS HC A02/MF A01

The application of biphase coding to data communication systems where the pulse dispersion is short compared to the bit time of the data signal to be transmitted is considered. As many optical fiber systems have this feature, biphase coding may be very attractive when the signal-to-noise ratio at the detector input is sufficiently high. Four spectral shaping solutions for biphase coding are worked out. The most satisfactory solution depends upon the design parameters of the system concerned.
Author (ESA)

N84-19699# Technische Hogeschool, Eindhoven (Netherlands). Information and Communication Theory Group.
COMPUTATION OF THE WYNER-ZIV RATE DISTORTION FUNCTION
F. M. J. Willems Jul. 1983 49 p refs
(Contract KU-0T/VI/17)
(EUT-83-E-140; ISBN-90-6144-140-4; ISSN-0167-9708) Avail: NTIS HC A03/MF A01

The Wyner-Ziv configuration (source coding situation with a fidelity criterion only, where the decoder gets side information from the sorce) is considered. The rate distortion function is formulated in terms of Shannon strategies. This formulation is proved to be continuous for distortion 0. Using the formulation an algorithm that computes the Wyner-Ziv function, is found. With FORTRAN computer programs based on this algorithm, the Wyner-Ziv function for three sources are computed and plotted. Author (ESA)

N84-19700# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
DATA COMMUNICATIONS IN THE MOBILE RADIO CHANNEL
Joanna Fronczak (University of Mining and Metallurgy, Krakow, Poland) Sep. 1983 39 p refs
(EUT-83-E-142; ISBN-90-6144-142-0; ISSN-0167-9708) Avail: NTIS HC A03/MF A01

A model for packet transfer between users accessing a common radio channel with slow Rayleigh fading is formulated. Numerical results show that fading may result in better link throughput, compared to the throughput of pure Aloha. The formulas apply when the transmitter powers are such that the receiver thermal noise can be omitted, and when the latter becomes significant. Author (ESA)

N84-19701# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
SOME SIGNAL PROCESSING METHODS BASED ON COVARIANCE ESTIMATES OF SIGNAL AND NOISE Progress Report
Ilkka Karasalo, Lars Goetherstroem, and Viggo Loesterlin Oct. 1983 67 p refs In SWEDISH; ENGLISH summary
(FOA-C-30343-E1; ISSN-0347-3708) Avail: NTIS HC A04/MF A01; Research Institute of National Defence, Stockholm KR 50

Three methods for detection and estimation with sensor arrays are described, together with the procedures developed for studying the methods by computer simulation. Two of them are generalized versions of the classical square law detector and Capron's detector. The third is based on a detector using the generalized eigenvalues and eigenvectors of the signal covariance matrice. Only the square law detector is not a so called high resolution method. Results of numerical simulations show the directional characteristics of the detectors for exact covariance matrices, and for covariance matrice estimates, produced by the update algorithm using computer generated signal and noise samples. The performance of all three detectors appears to be better with the fast algorithm for approximative rank-one updates of the covariance matrice, than with exact rank-one updates.
Author (ESA)

N84-19702# Electromagnetic Compatibility Analysis Center, Annapolis, Md.
INTERFERENCE MEASUREMENTS ON AMPLITUDE COMPANDORED SINGLE SIDEBAND (ACSB) LAND MOBIL RADIO
Henry Wootton Jun. 1983 190 p Prepared in cooperation with IIT Research Inst., Chicago
(PB84-123645; NTIA-CR-83-25) Avail: NTIS HC A09/MF A01 CSCL 17B

The National Telecommunications and Information Administration (NTIA) funded the ECAC to conduct adjacent-signal interference tests on a new radio system technology that shows promise of allowing smaller channel spacing in the Government land mobile radio band (162-174 MHz). The system tested was an amplitude compandored single-sideband radio (ACSB) manufactured by Sideband Technology, Inc. This report presents the adjacent-signal interference (ASI) result which will be employed by NTIA in evaluation of the potential usage of the ACSB technology in the Government land mobile radio band. Author (GRA)

N84-19703# M/A-COM Gallium Arsenide Products, Inc., Burlington, Mass.
THE TECHNICAL, ECONOMIC AND INSTITUTIONAL FEASIBILITY OF CUSTOMER PREMISES EARTH STATIONS FOR INTELSAT SERVICE
Richard J. ORorke, Jr. and Jack E. Cole Sep. 1983 421 p
(Contract NT-82-SAC-00097)
(PB84-128404; NTIA-CR-83-27) Avail: NTIS HC A18/MF A01 CSCL 17B

Barriers to customer premises Earth stations (CPES) for International Telecommunications Service via the INTELSAT system are primarily economic and institutional, rather than technical. The conditions under which International CPES would be economically justified are examined in various service scenarios. GRA

N84-19699# Concordia Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
COMPUTER AIDED SYNTHESIS OF A SATELLITE ANTENNA STRUCTURE WITH PROBABILISTIC CONSTRAINTS
V. K. Jha (SPAR Aerospace Ltd.), T. S. Sankar, and R. B. Bhat *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 79-89 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/13

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-19704# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ACTIVE MIXER WITH DUAL GATED FET M.S. Thesis [MISTURADOR ATIVO COM FET DE PORTA DUPLA]
Wilton Jose Fleming May 1983 238 p refs In PORTUGUESE; ENGLISH summary
(INPE-2744-TDL/135) Avail: NTIS HC A11/MF A01

The analysis and design of microwave mixers using dual gate FETs are presented. Computer programs were made in order to obtain the electrical model of the device and terminations which optimize the conversion gain, matching and isolation. It is shown that some empirical results published in the specialized literature may be obtained theoretically with the developed theory. A pratical example in "C" band, using a 30 MHz IF is presented.
Author

N84-19705*# Hughes Aircraft Co., Torrance, Calif.
Ka-BAND Ga-As FET NOISE RECEIVER/DEVICE DEVELOPMENT Final Technical Report, 1 Dec. 1979 - 1 May 1982
J. M. Schellenberg, M. Feng, L. H. Hackett, E. T. Watkins, and H. Yamasaki Nov. 1982 223 p refs
(Contract NAS5-25968)
(NASA-CR-175176; NAS 1.26:175176; W44362) Avail: NTIS HC A10/MF A01 CSCL 09A

The development of technology for a 30 GHz low noise receiver utilizing GaAs FET devices exclusively is discussed. This program required single and dual-gate FET devices, low noise FET amplifiers, dual-gate FET mixers, and FET oscillators operating at Ka-band frequencies. A 0.25 micrometer gate FET device, developed with a minimum noise figure of 3.3 dB at 29 GHz and an associated gain of 7.4 dB, was used to fabricate a 3-stage amplifier with a minimum noise figure and associated gain of 4.4 dB and 17 dB, respectively. The 1-dB gain bandwidth of this amplifier extended from below 26.5 GHz to 30.5 GHz. A dual-gate mixer with a 2 dB conversion loss and a minimum noise figure of 10 dB at 29 GHz as well as a dielectric resonator stabilized FET oscillator at 25 GHz for the receiver LO. From these components, a hybrid microwave integrated circuit receiver was constructed which demonstrates a minimum single-side band noise figure of 4.6 dB at 29 GHz with a conversion gain of 17 dB. The output power at the 1-dB gain compression point was -5 dBm. A.R.H.

N84-19706*# National Aeronautics and Space Administration, Washington, D. C.
FLUORESCENT DISCHARGE LAMP
Ei Mukai, Hitoshi Otsuka, Kazumasa Nomi, and Isao Honmo Jul. 1982 8 p Transl. into ENGLISH of Japanese patent no. 47-44980, 23 Dec. 1972 8p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77456; NAS 1.15:77456) Avail: NTIS HC A02/MF A01 CSCL 09A

A rapidly illuminating fluorescent lamp 1,200 mm long and 32.5 mm in diameter with an interior conducting strip which is compatible with conventional fixtures and ballasts is described. The fluorescent lamp is composed of a linear glass tube, electrodes sealed at both ends, mercury and raregas sealed in the glass tube, a fluorescent substance clad on the inner walls of the glass tube, and a clad conducting strip extending the entire length of the glass tube in the axial direction on the inner surface of the tube. S.L.

N84-19707*# Duke Univ., Durham, N. C. Center for Solid-State Power Conditioning and Control.
DERIVATION OF LINEARIZED TRANSFER FUNCTIONS FOR SWITCHING-MODE REGULATIONS. PHASE A: CURRENT STEP-UP AND VOLTAGE STEP-UP CONVERTERS
Ronald C. Wong, Ha.ry A. Owen, Jr., and Thomas G. Wilson 29 Sep. 1981 140 p refs
(NASA Order S-714408-B)
(NASA-CR-175219; NAS 1.26:175219) Avail: NTIS HC A07/MF A01 CSCL 10C

Small-signal models are derived for the power stage of the voltage step-up (boost) and the current step-up (buck) converters. The modeling covers operation in both the continuous-mmf mode and the discontinuous-mmf mode. The power stage in the regulated current step-up converter on board the Dynamics Explorer Satellite is used as an example to illustrate the procedures in obtaining the small-signal functions characterizing a regulated converter.
Author

N84-19708*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH EFFICIENCY IMPATT DIODES FOR 60 GHz INTERSATELLITE LINK APPLICATIONS
Edward J. Haugland 1984 14 p refs Presented at the 10th Communications Satellite Systems Conf., Orlando, Fla., 18-22 Mar. 1984 Sponsored in part by U.S. Air Force Space Div.
(NASA-TM-83584; E-1974; NAS 1.15:83584) Avail: NTIS HC A02/MF A01 CSCL 09A

Intersatellite links are expected to play an increasingly important role in future satellite systems. Improved components are required to properly utilize the wide bandwidth allocated for intersatellite link applications around 60 GHz. IMPATT diodes offer the highest potential performance as solid state power sources for a 60 GHz transmitter. Presently available devices do not have the desired power and efficiency. High efficiency, high power IMPATT diodes for intersatellite link applications are being developed by NASA and other government agencies. The development of high efficiency 60 GHz IMPATT diodes by NASA is described. Author

N84-19709*# Oregon Graduate Center for Study and Research, Beaverton.
EVALUATION OF SINGLE CRYSTAL LaB6 CATHODES FOR USE IN A HIGH FREQUENCY BACKWARD WAVE OSCILLATOR TUBE Interim Report, 1 Jul. 1983 - 1 Jan. 1984
L. W. Swanson, P. R. Davis, and G. A. Schwind 1 Jan. 1984 61 p refs
(Contract NAG3-434)
(NASA-CR-173343; NAS 1.26:173343) Avail: NTIS HC A04/MF A01 CSCL 09C

The results of thermionic emission and evaporation studies of single crystal LaB6 cathodes are given. A comparison between the (100), (210) and (310) crystal planes shows the (310) and (210) planes to possess a work function approx 0.2 eV lower than (100). This translates into a significant increase in current density, J, at a specified temperature. Comparison with a state-of-the-art impregnated dispenser cathode shows that LaB6 (310) is a superior cathode in nearly all respects except operating temperature at j< 10 A/sq cm. The 1600 K thermionic and room temperature retarding potential work functions for LaB6 (310) are 2.42 and 2.50 respectively. Author

N84-19710# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEMS OF BUILDING TURBOGENERATORS WITH WINDINGS MADE OF SUPERCONDUCTORS AND PURE METALS
G. G. Schastlivyy, G. M. Fedorenko, V. P. Kuyeva, and V. P. Kuchinskiy 16 Dec. 1983 11 p Transl. into ENGLISH from Probl. Tekhn. Electrodinam. (USSR), no. 38, 1972 p 4-9
(AD-A137198; FTD-ID(RS)T-1429-83) Avail: NTIS HC A02/MF A01 CSCL 13/9

The increase of the unit power of machines and power plants as a whole is a characteristic feature of the development of the turbogenerator building. The need for reducing the capital out lays and construction times, decreasing the operating expenses, and increasing the efficiency of the installations are caused by the rapid growth of the power systems. The use of superconductors and pure metals with cryogenic cooling opens new possibilities for progress in the manufacture of large electrical machines.
Author

N84-19711# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TRANSACTIONS OF THE INDUSTRIAL INSTITUTE OF ELECTRONICS (SELECTED ARTICLES)
K. Niemirowicz, J. Turozak, and J. Kawa 15 Dec. 1983 31 p Transl. into ENGLISH from Prace Przemyslowego Inst. Elektr. (Poland), v. 18, no. 61, 45-51 1977 p 5-21
(AD-A137204; FTD-ID(RS)T-1556-83) Avail: NTIS HC A03/MF A01 CSCL 11/7

The mechanism of the physicochemical phenomena occurring during the heat treatment of conductive films made from PdAg paste is presented. The effect of the method of the carrying out of the baking process on the structive of the films and thereby on their electrical and mechanical parameters is explained. Numerous figures and photographs illustrate the results of X ray, thermodifferential, and thermogravimetric microanalysis. GRA

N84-19712# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE RESEARCH ON SHORT BACKFIRE ANTENNA
C. L. Lin and X. M. Song 15 Dec. 1983 15 p Transl. into ENGLISH from Dianzixue Tongxun (China), v. 4, no. 6, Nov. 1982 p 331-336
(AD-A137209; FTD-ID(RS)T-1720-83) Avail: NTIS HC A02/MF A01 CSCL 09/5

A method to analyze the short backfire antenna was presented. The method interpreted the working principle of the backfire antenna relatively well. The gain of a backfire antenna developed by this method was approximately 2.5 dB higher than that of an ordinary short backfire antenna. Author

N84-19713# Reliability Analysis Center, Griffiss AFB, N. Y.
IMPACT OF ELECTROSTATICS ON IC (INTEGRATED CIRCUIT) FABRICATION Final Report, Jan. - Sep. 1983
William K. Denson and Timothy Turner Sep. 1983 39 p
(Contract F30602-81-C-0299)
(AD-A137372; RAC-TR-83-09-E01) Avail: NTIS HC A03/MF A01 CSCL 09/1

Integrated circuit fabrication processes inherently involve materials with a high propensity of triboelectric charge generation. This report details the results of a study in which the intent was: (1) to determine how electrostatic charges can catastrophically dame integrated circuits during their fabrication, and (2) to investigate the effect these charges have on individual fabrication processes. Possible reliability implications of the presence of electric charges during fabrication are also hypothesized. An experiment was also carried out to determine the susceptibility of IC's in wafer form. In these tests, devices were stressed at various levels and then electrically tested to determine their functionality. Additionally, the susceptibility modes of devices in wafer form were compared to those in packaged form. GRA

N84-19714# Mantech International Corp., Alexandria, Va.
ARMY DIGITAL TEST REQUIREMENTS ANALYTIC REPORT Final Report, Oct. 1982 - Jul. 1983
W. Schmitt and M. Kelly Jul. 1983 122 p
(Grant DAAK80-80-G-0520)
(AD-A137394; CECOM-80-0520-1) Avail: NTIS HC A06/MF A01 CSCL 09/5

During the past decade, both the capabilities and technology of Army electronic equipment have rapidly advanced with the advent of microprocessor-based systems and complex VLSI chips. The testing of these existing microprocessor-based systems/boards is presently straining the existing Army ATE assets in that expensive interface adaptors must be used for testing the microprocessor bidirectional data bus. Also, the digital pattern rate is at or above the upper limit of Army ATE and excessive test times are required because of limited bit pattern depth in existing Army ATE. This report deals with an analytic approach taken to identify the analysis of the Army digital test requirements of the next 5-8 years (1988-1991). An envelope of digital technology parameters was developed after an analysis of data extracted from ten military systems, six commercial systems, trade journals, conferences, technical manuals and ATE industry surveys. The report also addresses the premises that will be used to identify ATE requirements for the maintenance support of the present and future Army equipment. These premises will be used as a basis to generate a second report on ATE test requirements.
Author (GRA)

N84-19715# Stanford Univ., Calif.
RESEARCH IN VLSI SYSTEMS Technical Progress Report
Nov. 1983 7 p
(Contracts MDA903-79-C-0680; MDA903-83-C-0335; MDA903-80-C-0432; MDA903-80-C-0107)
(AD-A137396) Avail: NTIS HC A02/MF A01 CSCL 09/1

The parametric test facility provides two essential support functions for the Fast Turn-Around Laboratory - feedback of process-control information to the fabrication line, and characterization of active devices and parasitics for circuit design. The basic parametric tester, consisting of a Rucker and Kolls model 1032 stepping wafer prober, an HP 4145 semiconductor parameter analyzer, and an HP 6942A switching matrix controlled by an HP 9845 calculator, has been upgraded by addition of an HP 3456 system, DVM, an HP 5316 frequency counter, and an HP 4271 capacitance bridge. The DVM gives increased system flexibility while the frequency counter provides for the direct measurement of ring oscillator performance. Custom hardware has been designed and built for the rapid extraction of MOS transistor threshold and capacitor breakdown voltages. The system includes the necessary software to measure such process control parameters as line widths, sheet resistances, and threshold and breakdown voltages. Software has also been developed for the statistical analysis of these data on the HP 9845 computer. This software can produce maps of parameter variations across a wafer as well as the usual means, standard deviations, and histograms.
Author (GRA)

N84-19716# Naval Ocean Systems Center, San Diego, Calif.
TEMPERATURE EFFECTS OF CEMENT JOINTS IN CERAMIC-STACK RESONATORS Final Report, Apr. - Dec. 1982
C. L. Goodhart Jun. 1983 57 p
(NR Proj. S13-07)
(AD-A137435; NOSC/TR-860) Avail: NTIS HC A04/MF A01 CSCL 09/1

A temperature-related performance degradation has been observed in certain sonar transducers that employ ceramic-stack 33-mode resonators that contain joints. This study sought to identify the cause of this performance degradation and to determine resonator design or assembly methods that limit or eliminate this degradation. Experimental and computer modeling results show that the performance degradation is extreme for little or no final stress bias on the resonators and does not appear to be affected by the initial stress bias (the bias during cement curing). The degradation results from a temperature sensitivity of the stiffness of the cement/electrode joints. A high final stress bias of 28 million Pa essentially eliminates the performance degradation.
Author (GRA)

N84-19717# Naval Weapons Center, China Lake, Calif.
CLOSED LOOP ADAPTIVE CONTROL OF A 4.0 GIGAHERTZ REACTIVELY STEERED MICROSTRIP ARRAY - EXPERIMENTAL RESULTS Interim Report
R. J. Dinger Oct. 1983 22 p
(AD-A137523; AD-E900294; NWC-TP-6481) Avail: NTIS HC A02/MF A01 CSCL 09/5

The research described in this report was performed during fiscal year 1983 and was supported by Independent Research and Independent Exploratory Development funding. It is part of a continuing effort to explore novel radio frequency radiating and receiving structures for applications to airborne communications and radar systems. GRA

N84-19718# Florida Univ., Gainesville. Dept. of Electrical Engineering.
THEORETICAL-EXPERIMENTAL ANALYSIS OF THE EFFECTS OF GRAIN BOUNDARIES ON THE ELECTRICAL PROPERTIES OF SOI (SILICON-ON-INSULATOR) MOSFETS Annual Technical Report
Jerry G. Fossum Nov. 1983 130 p
(Contract N00014-82-K-2067)
(AD-A136975) Avail: NTIS HC A07/MF A01 CSCL 09/1

This first annual report describes the development of a physical model for thin-film SOI (insulating substrates) MOSFET that will form the basis of a computer model for existing circuit simulation programs, e.g., SPICE. The model will thus enable computer simulation of SOI ICs, e.g., stacked CMOS, the prevalent basis for three dimensional ICs. The model characterizes the (effective) field-effect mobility, the threshold voltage, and the source-drain leakage of a MOSFET fabricated in recrystallized polysilicon-on-SiO2. The resulting physical model for the SOI MOSFET describes the influence of the grain boundaries and defects in the channel on the electrical characteristics of the transistor in terms of its properties, e.g., the channel length, the doping density, the film and oxide thicknesses, and the grain-boundary trap density. Such

a model is essential in the optimization of the SOI technology and of the designs of SOI MOSFETs and ICs. It is also useful in developing grain-boundary passivation techniques, which we propose to do perhaps in the second year of this project. GRA

N84-19719# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
EVALUATION OF ADVANCED TECHNOLOGIES FOR POWER TRANSFORMERS Final Report, 1 Jun. 1979 - 30 Jun. 1981
Jun. 1983 117 p refs
(Contracts DE-AC01-77ET-29069; EC-77-C-01-2134)
(DE84-004046; DOE/ET-29069/T2) Avail: NTIS HC A06/MF A01

Six-inch size models, with multiple samples wound concentrically, offer a reliable vehicle for achieving consistent performance of the proposed turn-to-turn insulation system. Construction and testing of a short-circuit test coil and preliminary theoretical analysis produced information indicating the advantage of the sheet-wound construction when subjected to short-circuit forces and exposed those areas needing attention during the Phase 1 program. Preliminary development of electromagnetic axisymmetrical finite element programs for calculating the magnetic field (and related parameters) and temperature (and related parameters) were initiated. These programs have been completed in the Phase 1 program. Parametric design studies on prototype and demonstration units to be evaluated in the Phase 1 program and work on the facilities and equipment needs for the manufacturing technology work in Phase 1 were completed and revealed no major difficulties. This work has helped considerably in preparing for the extensive work planned in Phase 1 on these technologies. DOE

N84-19720# United Technologies Corp., South Windsor, Conn. Power Systems Div.
DEVELOPMENT OF MOLTEN CARBONATE FUEL CELL POWER PLANT TECHNOLOGY Quarterly Technical Progress Report, 1 Jan. - 31 Mar. 1983
Apr. 1983 30 p
(Contract DE-AC02-79ET-15440)
(DE84-002367; DOE/ET-15440/T1; QTPR-14; FCR-5198) Avail: NTIS HC A03/MF A01

The design of a prototype molten carbonate fuel cell stack which meets the requirements of a 1990's-competitive coal-fired electrical utility central station or industrial cogeneration power plant was developed and verified. DOE

N84-19721# Edgerton, Germeshausen and Grier, Inc., Salem, Mass.
HIGH VOLTAGE, LOW INDUCTANCE HYDROGEN THYRATRON STUDY PROGRAM, PHASE 5 Final Report, 1 Apr. - 31 Dec. 1982
Steven Friedman Aug. 1983 30 p refs Sponsored in part by Naval Surface Weapons Center
(Contracts DE-AC04-77AL-04047; EE-77-C-04-4047)
(DE84-000627; DOE/AL-04047/T12) Avail: NTIS HC A03/MF A01

50 kv per stage dynamic breakdown voltage (DBV) was demonstrated in low inductance multistage hydrogen thyratrons for total voltages up to nearly 200 kv, at pressures consistent with a 10 ns current rise time. High peak current operation has been demonstrated up to 14 ka at 56 kv (the limits of our high current test kit). Bottom stage holdoff the per stage DBV are comparable to that of the best single stage thyratrons, bottom stage holdoff, stage voltage addition, and prefire problems are solved. DOE

N84-19722# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
CRYOGENICALLY COOLED BROAD-BAND GaAs FIELD-EFFECT TRANSISTOR PREAMPLIFIER
C. C. Lo and Branko Leskovar Oct. 1983 9 p refs Presented at the Nucl. Sci. Symp., San Francisco, 19-22 Oct. 1983
(Contract DE-AC03-76SF-00098)
(DE84-004166; LBL-15983; CONF-831015-29) Avail: NTIS HC A02/MF A01

The antiproton source will be capable of accumulating a total of 4.3 x 10(11) antiprotons in 4 hours when a wideband feedback system for stochastic beam cooling is used. The feedback system detects and corrects at every revolution, the statistical fluctuations of the beam position and momentum. One of the essential components of such a system is a low noise broadband preamplifier. A cryogenically cooled 1 to 2 GHz low noise broadband prototype preamplifier utilizing GaAs field effect transistors is described for this application. The optimum preamplifier operating conditions for a minimum noise figure at temperatures of 2930K, 800K and 180K are given and are discussed. The phase shift characteristics, the input and output voltage standing wave ratio as a function of frequency and intermodulation products content as a function of the input power level are also measured. DOE

N84-19723# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Uebertragungstechnik und Elektroakustik.
LIFETIME PREDICTION FOR ELECTRONIC COMPONENTS AND CIRCUITS USING THE PHASE NOISE MEASURING METHOD [LEBENSDAUER VORHERSAGE FUER ELEKTRONISCHE BAUELEMENTE UND SCHALTUNGEN NACH DEM PHASENRAUSCHMESSVERFAHREN]
Karl Hoffmann and Reinhard Vogt Jun. 1982 21 p In GERMAN (FB-111) Avail: NTIS HC A02/MF A01

A method of lifetime prediction for electronic components and circuits using the temporal evolution of the phase noise level (PNL) as quality criterion is presented. The PNL is shown to be a direct measure for the advance of deficiency processes. A measuring device to determine PNL, and a mathematical method to evaluate the measured data are described. Measurements between 180 and 200 C show that PNL increases exponentially with time and that its temperature dependence obeys the Arrhenius law. The PNL also shows an exponential temporal evolution if NaCl is put on chip surfaces in order to change the activation energy for several deficiency processes. Author (ESA)

N84-19724# Valvo G.m.b.H., Hamburg (West Germany). Produktionsbereich MOS-ICs.
DEVELOPMENT OF TECHNOLOGY, CIRCUIT DESIGN AND SIMULATION PROCEDURES FOR VERY LARGE SCALE INTEGRATION (VLSI) SYSTEMS, VOLUME 1 Final Report, Dec. 1980
Ulrich Kohlschuetter, Rainer Laur, Egon Mathes, Wolfgang Nachbauer, Bernd Schendel, Guenther Schumicki, Hans Ludger Steinbach, and Wolfgang Zetzmann Bonn Bundesministerium fuer Forschung und Technologie Aug. 1983 334 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.
(BMFT-FB-T-83-170-Vol-1; ISSN-0340-7608) Avail: NTIS HC A15/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 76

Technology, computer aided design (CAD) and testing aspects of VLSI circuit manufacture are described. Etching, deposition, oxidation, doping and gettering step for a NMOS silicon gate technology are covered. Layout structures, the development of basic cells, and design systems with timing and logic simulation aiming at a closed CAD system from layout to testing are treated. The design of easily testable circuits and the generation of test programs are considered. Author (ESA)

N84-19725# Valvo G.m.b.H., Hamburg (West Germany). Produktionsbereich MOS-ICs.
DEVELOPMENT OF TECHNOLOGY, CIRCUIT DESIGN AND SIMULATION PROCEDURES FOR VERY LARGE SCALE INTEGRATION (VLSI) SYSTEMS, VOLUME 2 Final Report, Dec. 1980
Ulrich Kohlschuetter, Rainer Laur, Egon Mathes, Wolfgang Nachbauer, Bernd Schendel, Guenther Schumicki, Hans Ludger Steinbach, and Wolfgang Zetzmann Bonn Bundesministerium fuer Forschung und Technologie Aug. 1983 266 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.

(BMFT-FB-T-83-170-Vol-2; ISSN-0340-7608) Avail: NTIS HC A12/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 76

Technology, computer aided design (CAD) and testing aspects of VLSI circuit manufacture are described. Etching, deposition, oxidation, doping and gettering step for a NMOS silicon gate technology are covered. Layout structures, the development of basic cells, and design systems with timing and logic simulation aiming at a closed CAD system from layout to testing are treated. The design of easily testable circuits and the generation of test programs are considered. Author (ESA)

N84-19726# Merlin Gerin, Grenoble (France). Service Information.

NEW TECHNIQUES FOR MEDIUM VOLTAGE SF6 SWITCHES [NOUVELLES TECHNIQUES POUR LES DISJONCTEURS SF6 MOYENNE TENSION]

Jacques Hennebert Apr. 1983 11 p In FRENCH Presented at 4th Conf. on Elec. Power Supply Ind. (C.E.P.S.I.), Bangkok, 22-26 Nov. 1982
(Cahiers-Techniques-121) Avail: NTIS HC A02/MF A01

The standard SF6 self-compressing switch used with electric arcs is described. A rotating arc switch is presented. Air-tightness of SF6 envelopes is discussed, and systems requiring periodic topping up, and sealed systems requiring no maintenance are described. Author (ESA)

N84-19727# AEG-Telefunken, Ulm (West Germany). Fachbereich Technische Roehre.

DEVELOPMENT AND QUALIFICATION OF A 20 GHz/30 W TRAVELING WAVE TUBE Final Report, Apr. 1981

Gerhard Koschel Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 78 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-83-023; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,50

A traveling wave tube for application in 20 GHz satellite telecommunication systems is presented. Three prequalification samples were constructed and submitted to thermal and mechanical environment tests. Tubes were tested in a temperature range of -15 to -85 C and under a mechanical load of 19.6 g by vibration. Test results show no mechanical or electrical alteration. Main characteristics are: frequency range 17 to 21.5 GHz, effective bandwidth 1 GHz, saturation output 25 W, efficiency 38 %, weight 90 g, and expected life time > 7 yr. Author (ESA)

N84-19728# Varta Aktiengesellschaft Forschungs- und Entwicklungszentrum, Kelkheim (West Germany). Ressort Forschung und Entwicklung.

NICKEL CADMIUM CELL SD 15 K, QUALIFICATION AND OPERATION OF A MODULARIZED BATTERY 50 Ah, 100 V Final Report, Jun. 1979

Hans K. Koethe Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 163 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-83-030; ISSN-0170-1339) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33

Hermetically sealed nickel cadmium cells for space application are described. A modularized battery of 50 Ah capacity and 100V main bus voltage was developed. A modular unit of 1 to 12 cells is suggested. Geostationary orbit operation between minus 10 C and plus 40 C is possible by using the temperature guided constant current charging method. Author (ESA)

N84-19729# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.

NEW DIGITAL INTEGRATED CIRCUIT (IC) CONCEPT FOR COLOR TV RECEIVERS Final Report, Jun. 1982

Reinhard Hafenrichter, Alfred Jeschke, and Wolfgang Winkler Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 82 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-261; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17

Synchronization and deflection stages of color TV receivers are discussed. A monolithically integrated digital integrated circuit system connected to the intermediate frequency output was developed. Input parameter is the composite color video signal. The outputs use time quantized, pulse duration modulated signals to directly control output stages for horizontal deflection and raster correction, and the horizontal driver. Additional use of an electrically alterable read only memory permits automatic adjustment of the picture geometry by a microcomputer sensor system. Author (ESA)

N84-19730# Technische Hochschule, Aachen (West Germany). Inst. fuer Theoretische Elektrotechnik.

VERY LARGE SCALE INTEGRATION LOGICAL AND PHYSICAL STRUCTURES OF VLSI SYSTEMS Final Report, Dec. 1981

Dirk Beets, Reinhard Brock, Walter L. Engl, Herbert Huppertz, Wonchan Kim, Bernd Koenemann, Eike Krullmann, Hans Kuerten, Viktor Lewe, Hans-Rainer Schulte et al Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 391 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-267; ISSN-0340-7608) Avail: NTIS HC A17/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 55,50

A self-test for digital circuits was developed and implemented in a functional model and in a chip. It is based on data compression by a multiple-input signature register. A multifunctional logic circuit serves as latch, test pattern generator, test answer evaluator or part of a scan path. Application to the hardware model of a 16 bit microcomputer and a 8k bit CMOS read only memory is described. Bipolar VLSI including an electron beam pattern generator, low pressure deposition of SiO_2, Si_3N_4, and poly-Si, and low pressure epitaxy are examined. Fully implanted transistors were fabricated and low pressure lateral autodoping processes were modeled. It is concluded that different circuits can be put on one chip, covering the range from high packing density and low power consumption circuits to fast emitter coupled logic circuits with 340 psec gate delay. Author (ESA)

N84-19731# Siemens A.G., Munich (West Germany). MOS-Leistungshalbleiter.

DEVELOPMENT OF MICROCOMPUTER COMPATIBLE POWER SWITCHES Final Report, Sep. 1982

Helmut Strack Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 86 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-277; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18

A product family comprising three groups of devices called SIPMOS (Siemens Power MOS) is presented. It includes a PMOS transistor with source drain voltages from 50 to 1000 V, a FET-controlled PMOS-thyristor, and a light controlled MOS-fired triac (600 V, trigger current < 1mA). Author (ESA)

N84-19732# EUROSIL G.m.b.H., Eching (West Germany).

DEVELOPMENT OF A PROCESS FOR MANUFACTURING HIGH VOLTAGE CMOS CIRCUITS AND OF A TECHNOLOGY FOR GOLD BUMP PLATING FOR USE IN INTEGRATED DISPLAY SYSTEMS Final Report, Jun. 1982

Laurentiu Tilenschi, Gerhard Fischer, and Reinhard Klinger Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 91 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-280; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West

Germany DM 19

High voltage CMOS circuits and gold bump plating technologies for large area color display systems are considered. Based on a market survey of LCD driver chips a circuit with 20 V output voltage was designed and successfully tested. Bump technology investigations involved the selection of the metallurgical system, the resist technology, the electroplating technique and the metal etching. Two process alternatives compatible with CMOS products are proposed. The use of Ti-Pd-An and Ti-Ni systems as intermediate layer fulfil the requirements. The Ti-Ni system presents cost advantages. Author (ESA)

N84-19733# AEG-Telefunken, Heilbronn (West Germany). Geschaeftsbereich Elektronische Bauelemente.

TECHNOLOGY FOR LSI CIRCUITS COMBINING INTEGRATED INJECTION LOGIC AND BIPOLAR TRANSISTORS Final Report, Sep. 1982

Hermann Clauss Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 83 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-83-210; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,50

Large scale integrated circuits combining integrated injection logic (I2L) and bipolar circuits are described. By shrinking the lateral dimensions of the I2L-gates the packing density is increased from 230 to 640 gates/sqmm. Some I2L-Logic and bipolar transistors with breakdown voltage > 30 V were combined. For compact integrated circuits a gate array with 700 I2L-gates and bipolar periphery circuits was developed and tested. For short time realization of special mask designs a computer assisted design system was prepared. A high speed I2L allows 6 nsec delay time. The speed power product is 0,1 pJ at low currents and 0,5 pJ at 10 nsec delay. The packing density is 900 gates/sqmm.

Author (ESA)

N84-19734# Varta Batterie A.G., Kelkheim (West Germany). Forschungs-und Entwicklungszentrum.

LEAD-ACID BATTERY WITH IMPROVED CYCLE LIFE AND INCREASED EFFICIENCY FOR LEAD LEVELING APPLICATION AND ELECTRIC ROAD VEHICLES Final Report, Jun. 1982

August Winsel, Juergen Schulz, and Karl-Friedrich Guetlich Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 129 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-83-225; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 27

Lifetime and efficiency of lead acid batteries are discussed. A gas lift pump was used to prevent acid stratification and to reduce the charging factor (down to 1.03 to 1.05). A re-expansion method was applied and an expander depot and a compound separation were built in. Cycle life is increased from 700 cycles to 1690 cycles. Efficiency is increased by energy and time saving due to the reduced charging factor and by the use of a recombination stopper and a charge indicator with remote control. It is suggested that the lead acid system is still one of the best possibilities for electric road vehicle applications. Author (ESA)

N84-19735# Technische Hogeschool, Eindhoven (Netherlands). Dept of Electrical Engineering.

THE PAGE MATRIX: AN EXCELLENT TOOL FOR NOISE FILTERING OF MARKOV PARAMETERS, ORDER TESTING AND REALIZATION

A. A. H. Damen, P. M. J. VandenHof, and A. K. Hajdasinski Aug. 1982 43 p refs

(EUT-82-E-127; ISBN-90-6144-127-7; ISSN-0167-9708) Avail: NTIS HC A03/MF A01

A Page matrix is proposed as an alternative to the Hankel matrix in the realization problem. In the deterministic case the size of the Page matrix may be much smaller than the size of the Hankel matrix. The Page matrix is especially superior in the noisy case. For order testing, the decision concerning the dimension of the system, based on the singular values of the Page matrix, is straightforward, since all noisy data appear only once. Noise filtering is simplified by omitting the nonrelevant singular values. There is a constant weighting factor for the Markov parameters and the total reduction equals n/min(h,m), which is optimal for a square Page matrix. For approximate realization the noise filtering directly provides a set of unique Markov parameters in the approximated Page matrix of rank n, proving that information is reduced to the proper degree of freedom. Author (ESA)

N84-19736# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.

ARCING PHENOMENA IN HIGH VOLTAGE FUSES

J. E. Daalder and E. F. Schreurs Mar. 1983 67 p refs

(EUT-83-E-137; ISBN-90-6144-131-4; ISSN-0167-9708) Avail: NTIS HC A04/MF A01

Variables which govern the arc voltage of high voltage fuses with sand as filler material were studied at constant current in a range of several kA. Experimental relations were obtained for the burn-back rate of fuse elements. Preheating of the fuse element due to Joule heating is important. A model based on the energy processes in the electrode regions and including preheating accurately predicts all burn-back rate data. Arc voltage calculated as a function of time, based on an arc model and including arc elongation by burn-back and arc channel expansion, agrees with measured voltages. Results on the initial arc voltage generated by notch disruption and arc merging are discussed. Author (ESA)

N84-19737# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.

INTERRUPTION OF A DRY-TYPE TRANSFORMER IN NO-LOAD BY A VACUUM CIRCUIT-BREAKER

W. M. C. vandenHeuvel, J. E. Daalder, M. J. M. Boone, and L. A. H. Wilmes Aug. 1983 34 p refs

(EUT-83-E-141; ISBN-90-6144-141-2; ISSN-0167-9708) Avail: NTIS HC A03/MF A01

Overvoltages generated during interruption of a dry type delta-star connected transformer in no load by a vacuum breaker were studied. During interruption of inrush current 37% of the phase-to-ground overvoltages were > 5 pu, and 6% > 7 pu. Comparison of experimental and theoretical results using Boyle's model shows no discrepancy for inrush currents and clean overvoltages from the steady-state interruption. Overvoltages due to repetitive reignitions (not covered by Boyle's model) are higher than the calculated values during steady-state switching.

Author (ESA)

N84-19738# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.

STUDIES AND TESTS OF PYROELECTRIC VIDICONS Final Report

Rolf Helgodt Nov. 1983 50 p refs In SWEDISH; ENGLISH summary

(FOA-C-30317-E1; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

The pyroelectric vidicon (PEV) was studied as a complement or cheaper alternative to FLIR, nightvision and terminal guidance devices. The PEV's sensitivity to vibrations was reduced to an acceptable level. Infrared camera tests of a boat taken from an aircraft and vibration sensitivity tests of the PEV in an aircraft are reported. Characteristics of crystalline, polymer, and ceramic pyroelectric material are given. Author (ESA)

N84-19739# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.

A CONTROLLER FOR FREQUENCY HOPPING, WITH A FREQUENCY SYNTHESIZER

Lars Moell Dec. 1983 32 p In SWEDISH; ENGLISH summary

(FOA-C-30350-E4; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

Operating instructions and construction of a controller for a frequency synthesizer are described. The unit consists of a digital adding circuit, and a minicomputer generating the driving and timing signals. The generated frequency is pseudorandom. The hopping rate can be varied between 1 and 3000 hops per sec.
Author (ESA)

N84-19438# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
A NEW TRAVELING WAVE TUBE (TWT) COOLING CONCEPT
M. Haimerl and H. Kreeb *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 359-364 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19632*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ISEE-3 MICROWAVE FILTER REQUIREMENTS
J. L. Galvez, H. Marlin, and P. Stanton *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 114-119 ref (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 09A

N84-19670# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
VIBRATION CHALLENGES IN MICROELECTRONICS MANUFACTURING
Eric E. Ungar and Colin G. Gordon *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 51-58 (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 09/3

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-19740 Ruhr Univ., Bochum (West Germany). Inst. fuer Mechanik.
VARIATIONAL PRINCIPLES IN THERMOPLASTICITY. PART 1: HEAT TRANSFER AND PLASTICITY [VARIATIONSPRINZIPE DER THERMOPLASTIZITAET. 1: WAERMEAUSBREITUNG UND PLASTIZITAET]
Petrisor Mazilu Dec. 1982 111 p refs In GERMAN; ENGLISH summary
(RUB-IFM-MITT-33-Pt-1) Copyright. Avail: Issuing Activity

Variational principles in plasticity and in the theory of heat transfer are considered in order to complete and unify their mathematical theory. An extremal variational principle for the heat transfer processes based on a variational principle of virtual energy transfer is proposed. For the theory of plasticity, a unitary exposition of the stress rate variational principles and of the extremal variational principles based on the theory of convex analysis is presented. For plastic materials for which the convex analysis supplies no extremal variational principle, a two criterion extremal variational principle which is suited for a application in coupled thermomechanical processes is suggested. Author (ESA)

N84-19741*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL AND THEORETICAL DEPOSITION RATES FROM SALT-SEEDED COMBUSTION GASES OF A MACH 0.3 BURNER RIG
Gilbert Santoro, Fred J. Kohl, Carl A. Stearns, Sueleyman A. Goekoglu (Analex Corp.), and Daniel E. Rosner (Yale Univ.) Mar. 1984 46 p refs
(Contract NAS3-23293; Grant NAG3-201)
(NASA-TP-2225; E-1752; NAS 1.60:2225) Avail: NTIS HC A03/MF A01 CSCL 20D

Deposition rates on platinum-rhodium cylindrical collectors rotating in the cross streams of the combustion gases of a salt-seeded Mach 0.3 burner rig were determined. The collectors were internally air cooled so that their surface temperatures could be widely varied while they were exposed to constant combustion gas temperatures. The deposition rates were compared with those predicted by the chemically frozen boundary layer (CFBL) computer program, which is based on multicomponent vapor transport through the boundary layer. Excellent agreement was obtained between theory and experiment for the NaCl-seeded case, but the agreement lessened as the seed was changed to synthetic sea salt, $NaNO_3$, and K_2SO_4, respectively, and was particularly poor in the case of Na_2SO_4. However, when inertial impaction was assumed to be the deposition mechanism for the Na_2SO_4 case, the predicted rates agreed well with the experimental rates. The former were calculated from a mean particle diameter that was derived from the measured intial droplet size distribution of the solution spray. Critical experiments showed that liquid phase deposits were blown off the smooth surface of the platinum-rhodium collectors by the aerodynamic shear forces of the high-velocity combustion gases but that rough or porous surfaces retained their liquid deposits.
Author

N84-19742*# National Aeronautics and Space Administration, Washington, D. C.
ON TRANSIT TIME INSTABILITY IN LIQUID JETS
G. Grabitz and G. Meier Aug. 1982 11 p Transl. into ENGLISH of "Ueber Laufzeitinstabilitaeten in Fluessigkeitsstrahlen" Goettingen, 1982 6 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Max-Planck Inst. fuer Stroemungsforschung, Goettingen
(Contract NASw-3199)
(NASA-TM-77455; NAS 1.15:77455) Avail: NTIS HC A02/MF A01 CSCL 20D

A basic transit time instability in flows with disturbances of speed is found. It was shown that the mass distribution is established by and large by the described transit time effects. These transit time effects may also be involved for gas jets.
Author

N84-19743*# National Aeronautics and Space Administration, Washington, D. C.
HYDROMECHANICS AND HEAT AND MASS EXCHANGE IN WEIGHTLESSNESS (RUSSIAN BOOK): TABLE OF CONTENTS
V. S. Avduyevskiy and V. I. Poleshayev Dec. 1983 5 p Transl. into ENGLISH from the book "Gidromekhanika i Teplomassoobmen v Nevesomosti" Moscow, Nauka Press, 1982 p 261-263 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Inst. of Problems of Mechanics, Academy of Sciences (USSR), Moscow
(Contract NASw-3542)
(NASA-TM-77533; NAS 1.15:77533) Avail: NTIS HC A02/MF A01 CSCL 20D

The table of contents is given for a book on hydromechanics and heat and mass exchange in weightlessness. The book covers such subjects as hydromechanics, convection and heat and mass exchange, and technological experiments and complicated systems.
Author

N84-19744*# Oklahoma State Univ., Stillwater.
TURBULENCE CHARACTERISTICS OF SWIRLING FLOWFIELDS Ph.D. Thesis
Trevor William Jackson Dec. 1983 277 p refs
(Grant NAG3-74)
(NASA-CR-175392; NAS 1.26:175392) Avail: NTIS HC A13/MF A01 CSCL 20D

Combustor design phenomena; recirculating flows research; single-wire, six-orientation, eddy dissipation rate, and turbulence modeling measurement; directional sensitivity (DS); calibration equipment, confined jet facility, and hot-wire instrumentation; effects of swirl, strong contraction nozzle, and expansion ratio; and

turbulence parameters; uncertain; and DS in laminar jets; turbulent nonswirling jets, and turbulent swirling jets are discussed. N.W.

N84-19745*# Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
CONFINED TURBULENT SWIRLING RECIRCULATING FLOW PREDICTIONS Ph.D. Thesis
Muftah Taher Abujelala May 1984 237 p refs
(Grant NAG3-74)
(NASA-CR-175397; NAS 1.26:175397) Avail: NTIS HC A11/MF A01 CSCL 20D

Turbulent swirling flow, the STARPIC computer code, turbulence modeling of turbulent flows, the k-xi turbulence model and extensions, turbulence parameters deduction from swirling confined flow measurements, extension of the k-xi to confined swirling recirculating flows, and general predictions for confined turbulent swirling flow are discussed. N.W.

N84-19746*# University of Northern Arizona, Flagstaff.
SWIRL, EXPANSION RATIO AND BLOCKAGE EFFECTS ON CONFINED TURBULENT FLOW M.S. Thesis
Gregory Lloyd Scharrer 1982 175 p refs
(Grant NAG3-74)
(NASA-CR-175391; NAS 1.26:175391) Avail: NTIS HC A08/MF A01 CSCL 20D

A confined jet test facility, a swirles, flow visualization equipment, five-hole pitot probe instrumentation; flow visualization; and effects of swirl on open-ended flows, of gradual expansion on open-ended flows, and blockages of flows are addressed. N.W.

N84-19747*# Science Applications, Inc., Chatsworth, Calif. Combustion Science and Advanced Technology Dept.
TURBULENT TRANSPORT MODELS FOR SCRAMJET FLOWFIELDS Final Report
M. M. Sindir and P. T. Harsha Feb. 1984 91 p refs
(Contract NAS1-15988)
(NASA-CR-172284; NAS 1.26:172284) Avail: NTIS HC A05/MF A01 CSCL 20D

Turbulence modeling approaches were examined from the standpoint of their capability to predict the complex flowfield features observed in scramjet combustions. Thus, for example, the accuracy of each turbulence model, with respect to the prediction of recirculating flows, was examined. It was observed that for large diameter ratio axisymmetric sudden expansion flows, a choice of turbulence model was not critical because of the domination of their flowfields by pressure forces. For low diameter ratio axisymmetric sudden expansions and planar backward-facing steps flows, where turbulent shear stresses are of greater significance, the algebraic Reynolds stress approach, modified to increase its sensitivity to streamline curvature, was found to provide the best results. Results of the study also showed that strongly swirling flows provide a stringent test of turbulence model assumptions. Thus, although flows with very high swirl are not of great practical interest, they are useful for turbulence model development. Finally, it was also noted that numerical flowfields solution techniques have a strong interrelation with turbulence models, particularly with the turbulent transport models which involve source-dominated transport equations. Author

N84-19748*# Lockheed Missiles and Space Co., Huntsville, Ala.
MANUFACTURING IN SPACE: FLUID DYNAMICS NUMERICAL ANALYSIS Final Report, Jan. 1983 - Jan. 1984
S. J. Robertson Feb. 1984 38 p refs
(Contract NAS8-3281)
(NASA-CR-175401; NAS 1.26:175401; LMSC-HREC-TR-D951333) Avail: NTIS HC A03/MF A01 CSCL 20D

Thermocapillary convection in an air-jet Marangoni flow suppressing technique was numerically simulated for flow under various conditions of fluid properties, gravity, and temperature gradient. Results presented include computer generated plots of streamlines, velocities, and temperatures throughout the contained fluid flow, and plots of Marangoni flow velocities over the free surface. A.R.H.

N84-19749# Naval Research Lab., Washington, D. C. Plasma Theory Branch.
LONGITUDINAL RESISTIVITY AND INTERMEDIATE MACH NUMBER COLLISIONLESS TRANSVERSE MAGNETOSONIC SHOCKS Interim Report
W. M. Manheimer and D. S. Spicer 30 Dec. 1983 61 p
(S99-QMXB)
(AD-A137122; NRL-MR-5243) Avail: NTIS HC A04/MF A01 CSCL 20/4

It is shown that for collisionless transverse magnetosonic shocks, there exists an intermediate range of Mach numbers between the maximum Mach number for transverse resistivity and the onset of significant ion reflection. In this intermediate range, the structure is dominated by a breakdown of the quasi-neutrality approximation and longitudinal resistivity is a simple fluid model for the dissipation mechanism which forms the shock. GRA

N84-19750# Northwestern Univ., Evanston, Ill. Dept. of Engineering Science and Applied Mathematics.
THE STABILITY AND DYNAMICS OF ELASTIC STRUCTURES AND FLUID FLOWS Interim Report, 1 Oct. 1981 - 30 Oct. 1982
Edward L. Reiss Apr. 1983 9 p
(Grant AF-AFOSR-0016-80; AF Proj. 2304)
(AD-A137184; AFOSR-83-1348TR) Avail: NTIS HC A02/MF A01 CSCL 05/2

The main thrust of this research program has been the development and applications of asymptotic and perturbation for analyzing the stability and dynamics of elastic structures and fluid flows. The work is summarized in the papers listed in this report which have been published, accepted for publication, submitted for publication, or are in preparation for publication. Author (GRA)

N84-19751# Technion - Israel Inst. of Tech., Haifa.
EVOLUTION OF NONLINEAR WAVE GROUPS ON WATER OF SLOWLY-VARYING DEPTH Periodic Report, Feb. - Aug. 1983
Y. Frostig Aug. 1983 23 p
(Contract DAJA37-82-C-0300)
(AD-A137420; PR-4) Avail: NTIS HC A02/MF A01 CSCL 20/4

The aim of this paper is to present quantitative information about the approximate solution of the non-linear Schroedinger equation with varying coefficients and periodic boundary conditions, and comparing it with numerical solutions. A brief review of the method is developed and is based in the evaluation of an 'initial disturbance' at every point, and local application of the analytical solution. Quantitative information about the variation of the local 'initial disturbance' is provided and we present the comparison of the solution with numerical solutions. GRA

N84-19752# Colorado Univ., Boulder. Dept. of Mechanical Engineering.
ANALYTICAL PREDICTION OF TURBULENT HEAT TRANSFER PARAMETERS Annual Report, 1 Oct. 1982 - 30 Sep. 1983
A. Bejan Dec. 1983 21 p
(Contract N00014-79-C-0006; RR0-2403)
(AD-A137515; AD-E401120; CUMER-83-4) Avail: NTIS HC A02/MF A01 CSCL 20/4

The objective of this research is to construct a purely theoretical foundation for the phenomenon of turbulent heat transfer. In the present report it is shown that the buckling theory of inviscid streams and the classical hydrodynamic stability theory are in agreement with respect to the time scale criterion that accounts for transition to turbulence. Two experimental studies that confirm this correspondence are described. Author (GRA)

N84-19753# Ballistic Research Labs., Aberdeen Proving Ground, Md.
PRESSURE MEASUREMENTS IN A RAPIDLY ROTATING AND CONING, HIGHLY VISCOUS FLUID Final Report
Michael J. Nusca, William P. DAmico, and William G. Beims Nov. 1983 16 p Supersedes ARBRL-IMR-794, dated Sep. 8
(DA Proj. 1L1-62618-AH-80)
(AD-A136824; AD-F300362; ARBRL-MR-03325; ARBRL-IMR-794)

Avail: NTIS HC A02/MF A01 CSCL 17/7

The pressure on the endwall of a rapidly rotating and coning liquid-filled cylinder was measured. A gyroscope was used to generate the spin and coning motion. The Reynolds number based upon the radius, gyroscope spin, and liquid kinematic viscosity was 8.8. GRA

N84-19754# Naval Postgraduate School, Monterey, Calif.
FLOW GENERATION IN A NOVEL CENTRIFUGAL DIFFUSER TEST DEVICE M.S. Thesis
P. Vidos Sep. 1983 105 p
(AD-A136874) Avail: NTIS HC A06/MF A01 CSCL 20/4

Recognition of the need to develop optimum diffusers for advanced centrifugal compressors, resulted in the design and manufacture of a novel low-speed test facility for centrifugal diffuser testing. The CDTD was designed to allow the flow angle and wall boundary profiles into the test diffuser to be controlled by variable geometry in the flow generator. The present study reports on the design of the flow generator and the analysis of the internal flow using a NASA computer code (MERIDL). First test results are given and are compared with the results of a control volume analysis. The flow angle control technique was found to work effectively but to give somewhat smaller angles (by 4 deg) than were predicted. It was concluded that the information obtained would allow scaling of the device; however, an analysis code was needed which would accept the real physical boundary conditions. Author (GRA)

N84-19755# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ROUGHNESS EFFECTS ON COMPRESSOR BLADE PERFORMANCE IN CASCADE AT HIGH REYNOLDS NUMBER M.S. Thesis
F. J. Tanis, Jr. Nov. 1983 112 p
(AD-A136896; AFIT/GAE/AA/83D-23) Avail: NTIS HC A06/MF A01 CSCL 20/4

An experimental investigation of the effect of roughness on compressor blade performance in cascade at high Reynolds numbers was performed. A 7-blade cascade of NACA 64-A905 blades with a chord of 2 in. and aspect ratio of 1 was tested in linear cascade. The blades were mounted with a stagger angle of 31 deg and angle of attack of 15 deg. Spacing between blades was 1.33 in. which gave a solidity of 1.5. This study was divided into two parts: to determine the importance of the location of roughness on blade performance; and to determine how the degree of roughness affects blade performance. The velocity and turbulence intensity profiles of the flow region downstream of the center blade and the non-dimensional total pressure loss parameter omega bar were used to evaluate blade performance. Hot wire anemometry measured velocity and turbulence intensity profiles downstream of the blade. Measured exit velocity and static pressure were used to derive the exit total pressure. Roughness located near the leading edge of the blade caused the greatest impact on omega bar and the velocity and turbulence intensity profiles. Changes in magnitude of roughness did not affect blade performance until a threshold was exceeded; then performance decreased rapidly. GRA

N84-19756# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ANALYTICAL STUDY OF THE EFFECTS OF SURFACE ROUGHNESS ON A COMPRESSIBLE TURBULENT BOUNDARY LAYER M.S. Thesis
Z. H. Khan Dec. 1983 175 p
(AD-A136911; AFIT/GAE/AA/83D-9) Avail: NTIS HC A08/MF A01 CSCL 20/4

A previous study on the effect of surface roughness on the turbulent boundary layer, using a FORTRAN code, ITRACT, solved for the characteristics of a laminar, transitional and turbulent boundary layer on smooth surfaces. The present study investigates the influence of surface roughness on a compressible turbulent boundary layer and then extends the usefulness of ITRACT by including in it the optional capability of rough-surface boundary-layer calculations. Surface roughness was represented by distributed sources and sinks in the appropriate governing equations. The most important term is a sink term in the mean momentum equation, representing the form drag due to the roughness element. Governing boundary-layer equations for continuity, momentum, and energy were derived in a form to account for blockage effects due to roughness elements. The modified governing equations were then transformed using Probstein-Elliott and Levy-Lees transformations. The resulting equations, with appropriate boundary conditions, were solved by finite-difference techniques to determine the nondimensional velocity components and temperature at a finite number of nodes in the boundary-layer flow field. GRA

N84-19757# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EXPERIMENTAL STUDY OF THRUST AUGMENTING EJECTORS M.S. Thesis
W. D. Lewis Dec. 1983 59 p
(AD-A136929; AFIT/GAE/AA/83D-13) Avail: NTIS HC A04/MF A01 CSCL 20/4

An automated thrust augmentation data acquisition facility was designed and constructed. The facility provides the capability of measuring thrust augmentation ratio and mass flow augmentation ratio. A three dimensional graphics plot of exit flow is provided for flow analysis. Tests were conducted on a 4.4 in. diameter circular ejector, with eight primary nozzles mounted symmetrically along the perimeter of the inlet. A fixed ejector geometry was used. The ratio of mixing chamber area to diffuser exit area was 1.88. The fluid injection angle, measured from a line perpendicular to the ejector centerline, was varied and the thrust augmentation and mass flow augmentation ratios calculated. Both thrust augmentation and mass flow augmentation increased with fluid injection angle to the stall point where both decreased. Axial flow symmetry of primary air was found to affect stall along diffuser walls. Author (GRA)

N84-19758# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EFFECTS OF MULTIPLE CYLINDERS ON THE FORMATION OF VON KARMAN VORTEX STREETS M.S. Thesis
G. F. Clark Dec. 1983 97 p
(AD-A136930; AFIT/GAE/ENY/83D-5) Avail: NTIS HC A05/MF A01 CSCL 20/4

This study investigated the effect of multiple cylinders positioned within 6 diameters on the formation of von Karman vortex streets. This research used a water tunnel and a modified free jet to create desired flow conditions. Both flow visualization and hot film data were obtained under various conditions. Circular cylinders were used as models for the creation of the vortex street. A water table was modified into a water tunnel which was run at various flow velocities to produce flow conditions at Re sub D < or = 10,000. Shadowgraph-type photos were taken of the water flow field. A free jet was run at various flow velocities to produce flow condition at a higher Re sub D. A diverging dead-wake pattern was created by .794 cm diameter rods placed at the exit of a 1 cm by 10 cm free jet at M = .1 and .6. Classical vortex streets were created using the same size cylinder and a 5 cm by 5 cm free jet nozzle with an attached channel. Both schlieren photographs and hot film measurements were taken of the flow fields at Re sub D = 110,000 and 18,800 respectively. Water tunnel results indicate the formation of the von Karman vortex street has no dependence on either the absence or presence of other cylinders. GRA

N84-19759# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EFFECTS OF MEAN FLOW ON THE DYNAMIC CHARACTERISTICS OF FLUID TRANSMISSION LINES M.S. Thesis
M. S. Briski Dec. 1983 83 p
(AD-A136959; AFIT/GAE/AA/83D-2) Avail: NTIS HC A05/MF A01 CSCL 20/4

Theoretical predictions of the small signal frequency response

of round pneumatic transmission lines with turbulent mean flow were compared with experimental results. The frequency response curves were found for lines varying in length from 24 to 36 in. with inside diameters of 0.195, 0.119, and 0.041 in. The lines were tested at Reynolds numbers of 2000, 5000, and 10000. Theoretical solutions were obtained using Nichols' equations as modified by Krishnaiyer and Lechner. Solutions were also found using several different modifications of a constant LRC model developed by Moore. The results were mixed: for the 0.195 and 0.119 in. lines the prediction of gain was good but for the 0.041 in. lines the results were poor. The accuracy and applicability of the constant LRC model was explored along with its various modifications. The constant LRC model with the AC resistance showed potential for predicting the gain in fluid transmission lines with turbulent flow. The limitations and applicability of the constant LRC models were studied. Author (GRA)

N84-19760# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PREDICTING THE ONSET OF TURBULENCE IN THE PRESENCE OF A PRESSURE GRADIENT M.S. Thesis
Richard D. Charles Dec. 1983 74 p
(AD-A136980; AFIT/GAE/AA/83D-4) Avail: NTIS HC A04/MF A01 CSCL 20/4

An analytical study is presented regarding the determination of a pressure gradient dependent criterion for flow transition from laminar to turbulent flow. The results obtained were derived from two parallel approaches to flow stability; one of wave-dependent stability and the other of vorticity-dependent stability. In both cases, one of a variable transition Reynolds number dependent upon the ambient pressure gradient and the other one of a constant transition Reynolds number bases on the boundary-layer displacement thickness, the prediction results were either as good or better than those from available prediction methods. In addition these two criteria were used to predict transition locations on a NACA 0018 airfoil, again with favorable results. Author (GRA)

N84-19761# Wisconsin Univ., Madison. Dept. of Mathematics.
ANALYTICAL STUDIES OF TURBULENT FLOW FIELDS Final Report, 1 Sep. 1979 - 31 Mar. 1983
George L. Mellor 1 Dec. 1983 6 p
(Grant AF-AFOSR-0018-79; AF Proj. 2307)
(AD-A137008; AFOSR-83-1282TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

Studies focused on second moment turbulence modeling. The emphasis was on separating flows using a fully elliptical numerical algorithm. A new closure in two-point correlation space was investigated; it is used to account for several properties of decaying isotropic turbulence. GRA

N84-19762# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A STUDY OF ANNULAR DIFFUSER FLOW USING A PHOTON-CORRELATING LASER DOPPLER ANEMOMETER M.S. Thesis
Jeffrey M. Dierksen Dec. 1983 134 p
(AD-A137019; AD-E750174; AFIT/GAE/AA/83D-6) Avail: NTIS HC A07/MF A01 CSCL 20/4

An experimental investigation of air flow in an annular inlet and diffuser was conducted using a photon-correlating laser Doppler anemometer. The inlet has an inside wall radius of 22.9 cm (9.0 in.) and a cross-sectional area of 0.0426 sq m (0.4583 sq ft). The diffuser walls have a divergence half-angle of seven deg. Flow rates in the vicinity of 0.25 kg/sec (0.55 lbm/sec) were studied. The Reynolds number in the annular inlet was 18300. Flow in the annulus was turbulent and boundary layer growth was approximately 20% less than that predicted using flat plate boundary layer assumptions. The laser anemometer measurements are compared to hot film anemometer measurements. Good comparison was obtained except in the annular inlet. The difference is probably due to the differing boundary layer growth rates between the laser and hot film anemometer tests since they were conducted with different mass flow rates. The photon-correlating laser Doppler anemometer is evaluated in this application. The flexibility of a laser anemometer system in measuring 3-dimensional, internal flow is determined by two factors: the system's frequency shifting capability and the geometry of its optics. Reflected background light is inherent in measuring internal flows. Without a means of reducing the signal caused by this light, long measurement times are necessary for each data point. GRA

N84-19763# Scientific Research Associates, Inc., Glastonbury, Conn.
COMPUTATION OF DISCRETE SLANTED HOLE FILM COOLING FLOW USING THE NAVIER-STOKES EQUATIONS Final Report, 1 Apr. 1978 - 31 Aug. 1983
H. J. Gibeling, W. R. Briley, J. P. Kreskovsky, S. J. Shamroth, and H. McDonald Sep. 1983 63 p
(Contract F49620-78-C-0038; AF Proj. 2307)
(AD-A137022; R83-910002-F; AFOSR-83-1288TR) Avail: NTIS HC A04/MF A01 CSCL 13/1

An analysis and computational procedure have been developed for predicting the flow and heat transfer which results from coolant injection through a single row of round holes oriented at an angle to a flat surface with the injection and freestream velocity vectors coplanar. This method solves the compressible Navier-Stokes equations and utilizes 'zone embedding', surface-oriented coordinates, interactive boundary conditions, and an efficient, split LBI scheme. The approach treats the near-hole flow region where the complex film cooling flow is initially established. The initial studies considered only laminar flow in order to develop the computational procedure without the added complications of turbulence modeling. Calculations were performed on a coarse mesh at a blowing rate of 0.1 for both normal injection and injection at 45 degrees through a circular hole with the computational domain extending into the coolant hole. The results obtained were qualitatively reasonable and demonstrated the capability of the procedure for treating film cooling injection flows without simplifying assumptions in the near-hole flow region. The procedure was extended to turbulent flows and a calculation was performed for an injection angle of 35 degrees with a lateral hole spacing of three diameters. The results for this case display the expected large secondary flow development as a result of the interaction between the main stream flow and the injected fluid. Also, the temperature distribution predictions exhibit good qualitative agreement with experimental data with the quantitative discrepancies apparently due to either the turbulence model or inadequate grid resolution. GRA

N84-19764# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.
A SYNTHESIZED MODEL OF THE NEAR-WALL BEHAVIOR IN TURBULENT BOUNDARY LAYERS Interim Report
C. R. Smith, G. K. Patterson, and J. L. Zakin 1984 28 p To be presented at the 8th Symp. on Turbulence, Rolla, Mo., 1984
(Contract F49620-78-C-0071; AF Proj. 2307)
(AD-A137029; AFOSR-83-1336TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

A model of the near-wall behavior of turbulent boundary layers is presented. Based on an extensive series of primarily visualization experiments, which are described in overview, the model proposes a sequence of events which give rise to the bursting behavior responsible for turbulence production in the near-wall region. The model illustrates how hairpin vortex flow structures, generated during low-speed streak break down and ejection, are also reponsible for the streak regeneration process, thus defining a clear cycle of turbulence generation for the near-wall region. Author (GRA)

N84-19765# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
THREE DIMENSIONAL/BOUNDARY LAYER INTERACTION: LAMINAR AND TURBULENT BEHAVIOUR Final Scientific Report, 1 Dec. 1981 - 30 Nov. 1982
J. J. Ginoux and G. Degrez 15 Dec. 1982 65 p
(Grant AF-AFOSR-0051-82; AF Proj. 2307)
(AD-A137060; VKI-CR-1983-05; AFOSR-83-1321TR) Avail: NTIS

HC A04/MF A01 CSCL 20/4

An experimental study of a 3D skewed shock wave laminar boundary layer interaction has been carried out. The test configuration was a flat/finned plat arrangement with sharp leading edge fins having 4, 6 and 8 deg incidence relative to the free stream. The flat plate laminar boundary layer had thickness between 1.1 and 2.2 mm depending on test conditions. The unit Reynolds numbers used were 1.2 million and 2.4 million. Experimental surface data represented as surface flow visualizations and pressure distributions are presented for all test conditions. All tests were carried out at a nominal free stream Mach number of 2.25 and under approximately adiabatic wall conditions. The experimental results indicate that extended separation occurs even for the smallest wedge incidence, i.e., for a pressure ratio of 1.27 and that the extent of upstream influence is much larger in this 3D interaction than in comparable 2D interactions. Preliminary theoretical investigations show that an integral method is not suited for the study of the present interaction. The new implicit corrected viscosity method for solving the compressible Navier-Stokes equations can yield convergence speeds of order unity under suitable chosen conditions. Author (GRA)

N84-19766# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

AVAILABLE ENERGY METHOD FOR EVALUATING THERMODYNAMIC PERFORMANCE OF HEAT PUMP SYSTEMS

C. J. Bliem, Jr., O. J. Demuth, and S. L. Richlen Nov. 1983 71 p refs

(Contract DE-AC07-76ID-01570)

(DE84-005188; EGG-SE-6451) Avail: NTIS HC A04/MF A01

An available-energy-efficiency method, based on the Second Law of Thermodynamics, is developed for the evaluation and comparison of the thermodynamic performance of different types of heat pump systems. Defficiencies and limitations of the more commonly used performance indicators, coefficient of performance and fraction of Carnot cycle coefficient of performance, are discussed. Finally, several heat pumps of different types and in various stages of development are evaluated and compared in terms of available-energy efficiency as examples of the application of the method. DOE

N84-19767# Hanford Engineering Development Lab., Richland, Wash.

STABILITY OF THE FMIT HIGH SPEED, FREE SURFACE LIQUID JET FLOWING ALONG A CURVED WALL

J. A. Hassberger Oct. 1983 6 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983

(Contract DE-AC06-76FF-02170)

(DE84-003856; HEDL-SA-2923; CONF-831203-40) Avail: NTIS HC A02/MF A01

Measurements of surface wavelengths observed on the surface of curved wall, and free surface liquid jets are presented. Tests were performed in both liquid lithium and water in a Reynold's number range from 200 to 400, based on the surface speed and boundary layer displacement thickness. Results are found to compare favorably with observations of free surface flows in both submerged cavities and cylindrical jets. An effect of surface tension is observed from these results. DOE

N84-19768# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.

HEAT TRANSFER IN OSCILLATORY FLOW Progress Report, Jan. - Dec. 1983

D. P. Telionis and T. E. Diller 1983 39 p refs

(Grant DE-AS05-82ER-12022)

(DE84-005193; DOE/ER-12022/2) Avail: NTIS HC A03/MF A01

Work with a water tunnel facility and wind tunnel facilities to study heat transfer in oscillatory is reported. Work on both facilities include construction and modifications of the facilities themselves, instrumentation and data acquisition, and experimental measurements. A computer code was developed for the calculation of steady and unsteady heat transfer over the attached portion of the boundary layer. The equations of momentum and energy are recast in their finite difference form. DOE

N84-19769# Oak Ridge Gaseous Diffusion Plant, Tenn.

FINITE ELEMENT SIMULATION OF VISCOUS INCOMPRESSIBLE FLOWS

B. R. Becker, J. B. Drake, and B. R. Bass Nov. 1983 70 p refs

(Contract W-7405-eng-26)

(DE84-004355; K/CSD-18) Avail: NTIS HC A04/MF A01

The Galerkin-finite element approximation to the Navier-Stokes equations is developed from the continuous conservation laws governing the time-dependent flow of a viscous incompressible fluid. A computer code implementing the approach is described and results from several example problems are discussed. Biquadratic Lagrangian isoparametric elements are used to discretize the velocities. Bilinear elements discretize the pressure unknown. The nonlinear problem that results from the convection term in the Navier-Stokes equations is solved using a Picard iteration for the correct velocity and pressure fields. The stiffness matrix is factored at each step of the iteration using a frontal solution technique. Results from both steady-state and time-dependent convection dominated flows are given. Extensive appendixes accompany the report including all the details necessary to develop a finite element code. DOE

N84-19770# Argonne National Lab., Ill. Reactor Analysis and Safety Div.

LAMINARIZATION EFFECTS ON THE DYNAMICS OF A DISK LEVITATED BY INCOMPRESSIBLE FLUID FLOW

D. K. Warinner and J. T. Pearson (Purdue Univ.) 1984 13 p refs Presented at ASME Energy Sources Technol. Conf. and Exhibition, New Orleans, 12 Feb. 1984

(DE84-003612; CONF-840201-7) Avail: NTIS HC A02/MF A01

A nonlinear ordinary differential equation of motion for a disk parallel to a flat plat and levitated by incompressible turbulent fluid flow supplied from a central orifice was developed. The transient flow velocity and pressure field for the turbulent flow are found by integrating the time averaged Navier-Stokes equation with power law velocity and shear stress correlations. The results for the turbulent film are coupled with the study of inertia effects on the dynamics of a disk levitated by incompressible laminar flow to determine the results for a laminarizing flow. The transient pressure field is integrated to use in Newton's second law to determine the O.D.E. for the height of the disk as a function of time when the disk is perturbed from its equilibrium state by a forcing function. The theoretical magnitudes, frequencies, and damping coefficients of oscillation are shown to be within 8% of those measured. The numerical solution differs only slightly from the linearized solution: the latter provides relatively accurate closed form expressions for the frequencies and damping coefficients in terms of the geometry, load, mass flow rate, and the fluid properties. DOE

N84-19771# California Univ., Berkeley. Dept. of Materials Science and Mineral Engineering.

DIFFUSION OF GASES IN POROUS SOLIDS: SIMULATIONS AND MEASUREMENTS Quarterly Progress Report, 16 Jul. - 15 Oct. 1983

J. W. Evans 15 Oct. 1983 9 p

(Grant DE-FG22-82PC-50796)

(DE84-004146; DOE/PC-50796/T3; QR-5) Avail: NTIS HC A02/MF A01

This quarter the experimental apparatus, which measures gas flux through a porous plug, has been successfully used to measure the viscosity of argon, nitrogen and carbon dioxide and also the diffusivity of the argon-carbon dioxide and nitrogen-carbon dioxide gas pairs over a range of elevated temperatures. DOE

N84-19772# Systems Science and Software, La Jolla, Calif.

TRANSIENT GAS FLOW ALONG SINGLE OR BUNDLED ELECTRICAL CABLES SURROUNDED BY A PERMEABLE MEDIUM Final Report

R. H. Nilson Oct. 1983 65 p refs

(Contract W-7405-eng-48)
(DE84-004791; UCRL-15567; SSS-R-84-6386) Avail: NTIS HC A04/MF A01

The analysis presented here provides a family of closed-form solutions describing the transient behavior of a laminar or turbulent channel flow coupled with a Darcy or nonDarcy seepage flow. Cable-bundle flows were predicted to advance 80 to 120 meters within a minute or so, in reasonable agreement with field experience. Thus, the model seems to be useful in understanding the gross behavior of traditional stemming plans. Further analysis would be required to better model the hydrodynamic dispersion of radioactive gases, the confinement of the rock which surrounds the stemming column, and the overall gas-flow behavior within multilayer stemming plans which include fan-outs and plugs. The same basic model also describes the advance of cavity gas along a single cable surrounded by a low permeability stemming material such as cement or concrete. DOE

N84-19773# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerperforschung.
SUPERFLUID HYDRODYNAMICS OF INHOMOGENEOUS STATES: SYSTEMS WITH BROKEN GAUGE-TRANSLATION-SYMMETRY Thesis - Essen Univ. [SUPERFLUIDE HYDRODYNAMIK VON INHOMOGENEN ZUSTAENDEN SYSTEM MIT GEBROCHENER RELATIVER EICH-TRANSLATIONS-SYMMETRIE]
M. R. Stern Jul. 1983 113 p refs In GERMAN
(JUEL-1858; ISSN-0366-0885; D465) Avail: NTIS HC A06/MF A01

The hydrodynamics of the Fulde-Ferrell (FF) phase of a 3He-4He mixture was theoretically investigated. It is shown that the FF-state has a broken gauge-translation symmetry. Eleven modes are determined for the 11 hydrodynamic variables of the FF-state. The mode spectrum of the FF-state agrees qualitatively with that of the current-carrying state of 4Hell. Author (ESA)

N84-19774# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
AN INFRASTRUCTURE FOR COMPUTATIONAL FLUID DYNAMICS FOR COMPUTER AIDED DESIGN
W. Loeve 15 Sep. 1982 28 p refs In DUTCH; ENGLISH summary Presented at Symp. for Users of Finite Element Method, Delft, 3 Sep. 1982
(NLR-MP-82046-U) Avail: NTIS HC A03/MF A01

The infrastructure for information processing and the infrastructure for organizational control are discussed. Techniques are under development to support computer aided design of airplanes, ships and cars by handling the large amounts of data involved in the design process. It is shown that two aspects determine the usability of a calculation method: its properties, and the integration within the infrastructure for information processing in the organization. Author (ESA)

N84-19775# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. Fuer Theoretische Stroemungsmechanik.
MODEL EQUATIONS DESCRIBING UNSTEADY FLUID MOTION
Ulrich Nehring Oct. 1983 34 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-850)
(DFVRL-Mitt-83-17; ESA-TT-850) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 11

Nonlinear differential equations with four variables, based on a bulk-viscosity concept are tested numerically. An explicit finite difference method was used to simulate general flow fields. Three dimensional flow over a backward facing step as well as vortex separation past a rectangular block and longitudinal vortex past an inclined half-plate were calculated. For step flow a qualitative agreement with experimental results concerning wall pressure and length of flow reattachment is obtained. The physical interpretation of the equations accentuates the effects of pressure distribution on the formation of large scale structures and unsteady fluid motion. Author (ESA)

N84-19776# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
DEVELOPMENT OF A WIND TUNNEL TEST SECTION WITH ADAPTIVE FLEXIBLE WALLS FOR THREE-DIMENSIONAL FLOW Final Report, Oct. 1982
Uwe Ganzer, Yukihiro Igeta, Ernst Klein, and Rainer Redstock Bonn Bundesministerium fuer Forschung and Technologie Oct. 1983 73 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-83-026; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,50

Adaptive wall wind tunnels for 3D transonic testing are described. A test section with eight flexible solid walls with shape adaptable to streamline curvature was built. A computer program was developed to calculate a 3D wall contour from a measured 3D wall pressure distribution and an automatic control device for adjusting and controlling the wall positions was also developed. Pressure measurements using a body of revolution and three-component force measurements for a wing body combination were made. Test results confirm the constructional conception and the working principle of the system. Author (ESA)

N84-19777# Battelle Inst., Frankfurt am Main (West Germany).
FOREIGN PARTICLES AT A SOLIDIFICATION FRONT Final Report, Dec. 1982
Dieter Langbein Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 96 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-83-031; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20,50

The motion of particles at a solidification front is discussed. Deformation of the temperature field, flow of the melt around the particles, balance between viscous friction and van der Waals forces, intrinsic motion of liquid particles due to interface convection, deformation of liquid particles by fluid dynamic pressure, and diffusion of different components of nonuniform melts around the particles were investigated. Temperature and concentration fields around the particles determine the form of the solidification front, the latter the flow of the melt and the equilibrium of forces at the particles. Author (ESA)

N84-19778# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Hauptabteilung Neue Technologie Energietechnik.
FLAT PLATE HEAT PIPE COLLECTORS MADE BY ROLL BONDING Final Report, Dec. 1981
Werner Tanner, Wolfgang Molt, and Tilo Flesch Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 106 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-202; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22,50

Roll bonded heat pipes for solar collector applications are discussed. Thermodynamics of roll bonded plates with integrated heat exchanger were examined for different geometrical configurations. Prototypes were laboratory checked and modified. A strength problem occurred with increasing heat pipe pressure in the temperature range 130 to 200 C. Deformation of plates can be avoided by a pressure relief system. A version with three interrelated rolled sheets and an auxiliary stiffening channel structure at the rear side improves results without a pressure relief system. It is concluded that application of roll bonded heat pipes for solar collectors is not economical. Author (ESA)

N84-19779# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ON BIFURCATION PHENOMENA IN CONICAL FLOW PATTERNS
P. G. Bakker Apr. 1983 37 p refs
(VTH-LR-378) Avail: NTIS HC A03/MF A01

Conical flow patterns that occur if an unstable conical stagnation point bifurcates due to the variation of a local parameter are discussed. Breakup of a structurally unstable singularity into several stable singularities, and changes in the nature of the flow if two or more isolated singular points merge together are discussed. Although the analysis is restricted to conical flows the underlying ideas can be applied to flow problems such as the description of skin friction lines on a three dimensional body. Results are illustrated by the flow around a circular and elliptical cone in an inviscid supersonic main stream. Author (ESA)

N84-19780# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
RADIATIVE HEAT TRANSFER, FAVRE-AVERAGING AND TURBULENCE CLOSURE MODELS FOR COMBUSTION APPLICATIONS
J. B. Vos May 1983 64 p refs Sponsored by Project Office for Energy Research (PBE) Prepared in cooperation with Prins Maurits Laboratory (TNO)
(Contract DLR-11.0120)
(VTH-LR-383; PML-1983-114) Avail: NTIS HC A04/MF A01

Flow through a solid fuel combustion chamber (SFCC) was analyzed. Radiative heat transfer, Favre averaging of the conservation equations, and turbulence closure models for a computational model describing the flow through an SFCC were studied. A k-epsilon turbulence model is recommended. Author (ESA)

N84-19781# National Bureau of Standards, Washington, D.C. National Engineering Lab.
A HIGH-SPEED DATA ACQUISITION SYSTEM FOR FLUID MECHANICS MEASUREMENTS Final Report
L. P. Purtell Nov. 1983 34 p refs
(PB84-134592; NBS-TN-1181) Avail: NTIS HC A03/MF A01 CSCL 20D

The requirements, characteristics, and performance of a minicomputer-based data acquisition and analysis system suitable for research in fluid mechanics processes are presented. The particularly stringent requirements imposed by unsteady and turbulent flows are discussed including estimates of the required data acquisition rates and durations. GRA

N84-19782 Cincinnati Univ., Ohio.
SOLUTION OF PARTICULATED VISCOUS FLOW OVER A TWO DIMENSIONAL CYLINDER AND IN A RADIAL INFLOW TURBINE Ph.D. Thesis
Baily V. R. Vittal 1983 186 p
Avail: Univ. Microfilms Order No. DA8328333

Particle trajectories, particle fluid interaction, and erosion were studied for different solid particle sizes. The vicosity of the carrier fluid was into account and particle trajectories in viscous and inviscid fluid were systematically compared. Experiments carried out on particulated viscous flow over a two dimensional cylinder demonstrates the effect of the particles on such important flow properties as fluid steamline pattern, coefficient of drag and recirculation zone. The important effects of the solid particles on the fluid streamline pattern in a blade channel of a radial inflow turbine and a mixed flow turbine are evaluated. Results demonstrate the difference in particle trajectories, and impact locations between vicous and inviscid solutions, which would affect erosion prediction in turbomachinery. Statistical methods are used in combination with three dimensional particle trajectory calculations, the basic experimental erosion data and particle rebound characteristics, to predict erosion pattern in the turbine rotor blades. Dissert. Abstr.

N84-19783 Iowa Univ., Iowa City.
TURBULENCE MEASUREMENTS IN PLANE JETS AND PLUMES IN CROSSFLOW Ph.D. Thesis
Hiroyuki Haniu 1983 283 p
Avail: Univ. Microfilms Order No. DA8327385

Both buoyant and nonbuoyant two dimensional jets in crossflow were studied in a hydraulic flume. Instantaneous velocity and instantaneous temperature were measured using a two component Laser Doppler Anemometer (LDA) and a microresistance thermometer. The data obtained consist of the mean as well as turbulent properties of the flow including the information on intermittency and turbulent spectra. In addition to providing a much needed data base for development of turbulence models, the depth and extent of the present measurements make it possible to understand qualitatively the effect of streamline curvature and buoyancy in these complex free shear flows. Dissert. Abstr.

N84-19403# Societe Nationale Industrielle Aerospatiale, Cannes (France).
PRELIMINARY TESTS ON THE U-SHAPED HEAT PIPES OF TV-SAT/TDF-1 [LES ESSAIS ELEMENTAIRES DES CALODUCS EN U DE TV/SAT/TDF-1]
M. Amidieu *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 53-61 In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19404# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
DESIGN ASPECTS OF TV-SAT/TDF-1 HEAT PIPES
R. Meyer and U. Laux *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 63-66 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19405# Aeritalia S.p.A., Torino (Italy). Space Sector.
HEAT PIPES FOR THE L-SAT COMMUNICATIONS MODULE RADIATORS
M. Papaccia, V. Perotto, B. Sessions, and H. Kreeb (Dornier-Werke G.m.b.H., Friedrichshafen, West Germany) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 67-74 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19406# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
A VARIABLE CONDUCTANCE HEAT PIPE (VCHP) RADIATOR SYSTEM FOR COMMUNICATIONS PAYLOADS
N. H. Pennings and C. J. Savage (ESTEC, Noordwijk, Netherlands) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 75-81 Sponsored by ESTEC (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19407# Centre National d'Etudes Spatiales, Toulouse (France).
OUTLINE AND EVALUATION OF A SPACEBORNE SODIUM HEAT PIPE FURNACE WITH THREE COMPARTMENTS [ELABORATION ET EVALUATION DES PERFORMANCES D'UN FOUR SPATIAL CALODUC A SODIUM A 3 ALVEOLES]
G. Bellaiche, B. Duc (CEA, Grenoble, France), J. Chaudourne (CEA, Grenoble, France), J. J. Favier (CEA, Grenoble, France), and P. Contamin (CEA, Grenoble, France) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 83-90 refs In FRENCH; ENGLISH summary (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19422# Indian Space Research Organization, Bangalore. Satellite Center.
THERMAL NETWORK CORRECTION BY SIMPLEX OPTIMIZATION
K. Badari Narayana, D. R. Bhandari, and H. N. Murthy *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 223-229 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19423# Institute of Space and Astronautical Science, Tokyo (Japan).
THERMOFLUIDYNAMICS OF HEAT PIPES
Koichi Oshima and Masahide Murakami (Tsukuba University, Japan) *In* ESA Environ. and Thermal Control Systems for Space Vehicles

Dec. 1983 p 231-234 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19424# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
UNIAXIAL MODEL FOR GAS-LOADED VARIABLE CONDUCTANCE HEAT PIPE PERFORMANCE: THE EFFECTS OF VAPOR FLOW, FRICTION, AND INERTIA
A. A. M. Delil and H. A. M. Daniels *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 235-241 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19425# European Space Research and Technology Center, Noordwijk (Netherlands).
MANIP AND MINIP, NEW MODELING TOOLS FOR THE THERMAL ENGINEER
A. M. Davidson and C. Stroom *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 243-248 Original contains color illustrations (For primary document see N84-19396 10-18)
Avail: NTIS HC A21/MF A01

N84-19440# Societe Nationale Industrielle Aerospatiale, Cannes (France).
THERMAL CONTROL OF MULTIMISSION BATTERY COMPARTEMENT OF SPOT [CONTROLE THERMIQUE DU COMPARTIMENT BATTERIES SPOT MULTIMISSION]
H. Fagnoni *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 371-379 refs In FRENCH (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19459# Science Research Council, Chilton (England). Rutherford Appleton Lab.
CALCULATION OF TWO-DIMENSIONAL FOCUSING FACTOR DISTRIBUTION DUE TO SPECULAR FLUX TRANSFER BETWEEN GENERAL CURVES
D. M. Simpson *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 505-520 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19461# Aeritalia S.p.A., Torino (Italy). Space Sector.
SIMPLIFICATION OF THERMAL DESIGN BY THE USE OF EFFECTIVE SINK TEMPERATURE METHOD
C. Chiarelli and F. Al-Astrabadi *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 527-530 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19847# Argonne National Lab., Ill. Components Technology Div.
INSTABILITY OF CIRCULAR CYLINDER ARRAYS IN CROSS FLOW
S. S. Chen *In* the Shock and Vibration Digest, Vol. 15, No. 7 Jul. 1983 p 17-26 refs (For primary document see N84-19845 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/4

N84-19882# Michigan State Univ., East Lansing.
EXPERIMENTAL VALIDATION OF THE COMPONENT SYNTHESIS METHOD FOR PREDICTING VIBRATION OF LIQUID-FILLED PIPING
F. J. Hatfield, D. C. Wiggert, and L. C. Davidson (Naval Ship Research and Development Center) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 1-10 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/4

N84-19884# Naval Surface Weapons Center, White Oak, Md.
FLUID-STRUCTURE INTERACTION BY THE METHOD OF CHARACTERISTICS
Franklin D. Hains *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 23-32 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/4

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N84-19784*# Boeing Aerospace Co., Seattle, Wash.
CENTRIFUGE IMPACT CRATERING EXPERIMENT 5 Semiannual Report
15 Jan. 1984 39 p refs
(Contract NASw-3291)
(NASA-CR-173354; NAS 1.26:173354) Avail: NTIS HC A03/MF A01 CSCL 14B

Transient crates motions, cratering flow fields, crates dynamics, determining impact conditions from total crater welt, centrifuge quarter-space cratering, and impact cratering mechanics research is documented. N.W.

N84-19785# Varian Associates, Palo Alto, Calif.
ANALYSIS OF THE OUTPUT MODE FROM 60 GHz, 200 kW PULSED AND CW GYROTRONS
K. Felch, R. Bier, L. Fox, H. Huey, H. Jory, J. Manca, J. Shively, S. Spang, and C. Moeller (GA Technologies, San Diego, Calif.) 1983 6 p refs Presented at 8th Internatl. Conf. on Infrared and Millimeter Waves, Miami Beach, Fla., 12 Dec. 1983
(Contract W-7405-eng-26)
(DE84-004586; CONF-831245-2) Avail: NTIS HC A02/MF A01

A Varian 60 GHz, CW gyrotron was operated at power levels up to 200 kW CW. The tube employs a TE011/TE021 complex interaction cavity which inhibits mode competition by the TE221 mode with the desired TE021 mode. The output mode of the cavity is nominally in the TE02 circular waveguide mode in overmoded waveguide. Since the output waveguide also serves as the gyrotron collector, mode conversion occurs in the taper sections and gaps incorporated into the collector. Comparison of measurement of the mode conversion on a 60 GHz, 200 kW, 100 ms pulse tube with similar measurements on the 60 GHz. 200 kW, CW gyrotron indicate that the CW tube has significantly more conversion of the TE02 mode into other TE/sub on/ modes than does the pulse tube. Current design work is aimed at reducing the mode conversion of the CW design to the same levels as the pulse design (less than or equal to 10% mode conversion). DOE

N84-19786*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE NEW MSFC SOLAR VECTOR MAGNETOGRAPH. CENTER DIRECTOR'S DISCRETIONARY FUND Final Report
M. J. Hagyard, E. A. West, and N. P. Cumings Feb. 1984 30 p refs
(NASA-TM-82568; NAS 1.15:82568) Avail: NTIS HC A03/MF A01 CSCL 14B

The unique MSFC solar vector magnetograph allows measurements of all three components of the Sun's photospheric magnetic field over a wide field-of-view with spatial resolution determined by a 2.7 x 2.7 arc second pixel size. This system underwent extensive modifications to improve its sensitivity and temporal response. The modifications included replacing an SEC vidicon detector with a solid-state CCD camera; replacing the original digital logic circuitry with an electronic controller and a computer to provide

complete, programmable control over the entire operation of the magnetograph; and installing a new polarimeter which consists of a single electro-optical modulator coupled with interchangeable waveplates mounted on a rotating assembly. The system is described and results of calibrations and tests are presented. Initial observations of solar magnetic fields with the new magnetograph are presented. Author

N84-19787*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE INFINITE LINE PRESSURE PROBE
David R. Englund and W. Bruce Richards (Oberlin Coll., Ohio) 1984 17 p refs Proposed for presentation at the 30th Intern. Instrumentation Symp., Denver, 7-10 May 1984
(NASA-TM-83582; E-1973; NAS 1.15:83582) Avail: NTIS HC A02/MF A01 CSCL 14B

The infinite line pressure probe provides a means for measuring high frequency fluctuating pressures in difficult environments. A properly designed infinite line probe does not resonate; thus its frequency response is not limited by acoustic resonance in the probe tubing, as in conventional probes. The characteristics of infinite line pressure probes are reviewed and some applications in turbine engine research are described. A probe with a flat-oval cross section, permitting a constant-impedance pressure transducer installation, is described. Techniques for predicting the frequency response of probes with both circular and flat-oval cross sections are also cited. Author

N84-19788# Washington State Univ., Pullman. Dept. of Physics.
DETERMINING AND MODELING THE RESPONSE OF PIEZO-RESISTANCE TRANSDUCERS TO DYNAMIC LOADING Annual Report, 29 May 1982 - 30 Jun. 1983
Y. M. Gupta Jun. 1983 8 p
(Grant AF-AFOSR-0132-82; AF Proj. 2307)
(AD-A137121; AFOSR-83-1286TR) Avail: NTIS HC A02/MF A01 CSCL 09/5

The work of the past year has concentrated on experimental measurements and their analyses. The response of Ytterbium (Yb) foils, oriented parallel and perpendicular to the shock front, was obtained for well defined loading and unloading. The foils were embedded in a PMMA matrix and the longitudinal stress ranged between 0.1 and 2.0 GPa. Results have provided an empirical calibration for Yb under shock wave uniaxial strain loading. An important result from these experiments is the verification of an elastic-plastic inclusion analysis. The results of the 1.9 GPa experiment suggest that under certain conditions a dynamic inclusion analysis will be necessary. Another important aspect of this year's effort was the development of an experimental method to perform low strain-rate tensile experiments on gauge foils. GRA

N84-19789# Florida Univ., Gainesville. Lab. for Space Astronomy.
SHUTTLE FLIGHT TEST OF AN ADVANCED GAMMA-RAY DETECTION SYSTEM Final Scientific Report, 1 Oct. 1982 - 31 Mar. 1983
Alfred C. Rester, Jr. Nov. 1983 20 p
(Grant AF-AFOSR-0116-83; AF Proj. 2309)
(AD-A136681; AFOSR-83-1201TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

The Space Astronomy Laboratory plans to fly an advanced gamma-ray spectrometer aboard a future Shuttle flight. The 'GRAD' spectrometer employs a new bismuth germanate (BGO) anticompton shield and n-type high purity germanium detector. BGO, because of its high atomic number, requires only 1/12 the volume and 1/6 the weight of an equally sensitive sodium iodide crystal. The n-type germanium detector is at least 25 times more resistant to neutron radiation damage than a conventional detector and has a very broad spectral response of 5 keV to 10 MeV. Neither of these materials has been subjected to the space environment as working components of a detector system. The radioactivation of the new detector materials by cosmic rays and fast neutrons, as well as other effects of launching, landing and operation in the space environment on the detector system will be monitored and calibrated. Early information on gamma-ray background from activation of the shuttle itself will also be obtained. In addition to the technological information derived from the experiment, high energy-resolution spectra of the Sun and the galactic center will be taken. Author (GRA)

N84-19790# WICAT Systems, Inc., Orem, Utah.
INSTRUCTIONAL SYSTEMS DEVELOPMENT MODEL FOR INTERACTIVE VIDEODISC Final Report, Feb. 1979 - Apr. 1982
J. Olin Campbell, David M. Tuttle, and Andrew S. Gibbons Dec. 1983 48 p
(Contract MDA903-78-C-2023; DA Proj. 2Q1-62722-A-791)
(AD-A136737; ARI-RN-83-53) Avail: NTIS HC A03/MF A01 CSCL 14/3

This is the third and final report on an Instructional Systems Development Model for Videodisc Training Delivery Systems with Interactive Capability. The report reviews the current state of the art, and describes two videodiscs made for the project, with lessons learned from them. Each block of the Interservice Procedures for Instructional Systems Development (IPISD) is described in terms of the new opportunities and requirements of interactive videodisc. A separate report, 'Interactive Videodisc Design and Production Workshop Guide,' presents a step by step procedure for making interactive videodiscs. Author (GRA)

N84-19791# WICAT Systems, Inc., Orem, Utah.
INTERACTIVE VIDEODISC DESIGN AND PRODUCTION, WORKSHOP GUIDE
J. Olin Campbell, David M. Tuttle, and Andrew S. Gibbons Dec. 1983 193 p
(Contract MDA903-78-C-2023; DA Proj. 2Q1-62722-A-791)
(AD-A136830; ARI-RN-83-52) Avail: NTIS HC A09/MF A01 CSCL 14/3

This is the Workshop Guide for the design and production of Interactive Videodiscs. Modules present: Analysis and Project Planning; Design and Authoring; Preproduction; and Production. GRA

N84-19792# Oak Ridge Gaseous Diffusion Plant, Tenn. Centrifuge Physics Dept.
REMOTE THERMOMETRY OF MOVING SURFACES BY LASER-INDUCED FLUORESCENCE OF SURFACE-BONDED PHOSPHOR
M. R. Cats, S. W. Allison, L. A. Franks (Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.), M. A. Nelson (Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.), T. J. Davies (Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.), and B. W. Noel (LASL) Nov. 1983 25 p refs Presented at Intern. Congr. on Appl. of Lasers and Electro-optics, Los Angeles, 14 Nov. 1983
(Contract W-7405-eng-26)
(DE84-004264; K/TS-11232; CONF-831195-5) Avail: NTIS HC A02/MF A01

Surface temperature of a rotating flywheel was measured remotely. A fluorescence from a pulsed nitrogen laser in lanthanum oxysulfide adhered to the surface was induced. DOE

N84-19793# Fermi National Accelerator Lab., Batavia, Ill.
HELIUM LEAK DETECTOR IMPROVED SENSITIVITY SPEED CHOKE
F. Juravic Dec. 1983 7 p refs
(Contract DE-AC02-76CH-03000)
(DE84-005160; FERMILAB/TM-1233) Avail: NTIS HC A02/MF A01

To achieve the best of steady sensitivity of a leak detector and the best opening of the valve for quick clean up, a gate valve was installed with a predetermined hole drilled in the seat plate and positioned between a diffusion pump and pumping system isolation valve. The technique was tried on a cold trapped mass spectrometer leak detector. DOE

N84-19794# Varian Associates, Palo Alto, Calif.
FIRST 200 kW CW OPERATION OF A GHz GYROTRON
H. Jory, R. Bier, S. Evans, K. Felch, L. Fox, H. Huey, J. Shively, and S. Spang 1983 14 p refs Presented at Intern. Electron Device Meeting, Washington, D.C., 5 Dec. 1983
(Contract W-7405-eng-26)
(DE84-004573; CONF-831243-4) Avail: NTIS HC A02/MF A01

The gyrotron, a microwave tube which employs the electron cyclotron maser interaction to produce high power output at millimeter wavelengths, has important and growing applications for heating of plasma in controlled thermonuclear fusion experiments. The Varian 60 GHz gyrotron recently generated microwave power in excess of 200 kW during CW operation, with excellent dynamic range and operating stability. This is the highest average power ever produced by a microwave tube in the millimeter wave region. The gyrotron design is described and test results are presented. DOE

N84-19795# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Service Div.
MULTICHANNEL INTERVAL TIMER
B. T. Turko Oct. 1983 8 p refs Presented at the Nucl. Sci. Symp., San Francisco, 19-22 Oct. 1983
(Contract DE-AC03-76SF-00098)
(DE84-004635; LBL-15942; CONF-831015-28) Avail: NTIS HC A02/MF A01

A CAMAC based modular multichannel time digitizer with a common start enabling twelve independent stop inputs. Ten time ranges from 1.5 microns to 1.3 microns can be preset. Time can be read out in twelve 24-bit words either via CAMAC Crate Controller or an external FIFO register. LSB time calibration is 78.125 ps. An additional word reads out the operational status of twevle stop channels. The system consists of two modules. The analog module contains a reference clock and 13 analog time stretchers. The timer has an excellent differential linearity, thermal stability and crosstalk free performance. DOE

N84-19796# Brookhaven National Lab., Upton, N. Y.
X-RAY HOLOGRAPHIC MICROSCOPY EXPERIMENTS AT THE BROOKHAVEN SYNCHROTRON LIGHT SOURCE
M. R. Howells, M. Larocci, J. Kenney, J. Kirz, and H. Rarback 1983 12 p refs Presented at the Advances in Soft X-ray Sci. and Technol. Conf., Upton, N.Y., 17-20 Oct. 1983 Prepared in cooperation with State Univ. of New York, Stony Brook
(Contract DE-AC02-76CH-00016)
(DE84-004289; BNL-34014; CONF-8310172-10) Avail: NTIS HC A02/MF A01

Soft X-ray holographic microscopy is discussed. Three series of measurements were made using the Brookhaven 750 MeV storage ring as an X-ray source. Young slits fringes, Gabor (in line) holograms and data pertaining to the soft X-ray performance of photographic plates are reported. The measurements are discussed for recording techniques and the experimental limitations in effect. Reconstruction using visible light is also discussed. DOE

N84-19797# California Univ., Livermore. Lawrence Livermore Lab. Office of Laser Fusion Program.
DEVELOPMENT OF SOFT X-RAY STREAK CAMERAS AT LAWRENCE LIVERMORE NATIONAL LABORATORY
Hector Medecki, Glen E. Phillips, and John F. Bushman 27 Jun. 1983 12 p ref Submitted for publication
(Contract W-7405-eng-48)
(DE83-015841; UCRL-89430) Avail: NTIS HC A02/MF A01

Soft X-ray stream cameras are used in conjunction with several instruments for the diagnostic of laser irradiated targets. The development of cameras which satisfy the requirements of the laser facility, to improve the reliability and performance of the camera and to reduce the level of effort required to set and operate each diagnostic is reported. The implemented soft X-ray streak cameras can be operated either manually or automatically. DOE

N84-19798# Los Alamos Scientific Lab., N. Mex.
SMART INSTRUMENTATION DEVELOPMENT AT LOS ALAMOS
B. Erkkila 1984 12 p refs Presented at 17th Midyear Topical Meeting of the Health Phys. Soc., Pasco, Wash., 5-9 Feb. 1984
(Contract W-7405-eng-36)
(DE84-003821; LA-UR-83-3409; CONF-840202-3) Avail: NTIS HC A02/MF A01

For several years Los Alamos has incorporated microprocessors into instruments to expand the capability of portable survey type equipment. Beginning with portable pulse height analyzers, the developments expanded to small dedicated instruments which handle the measurement and interpretation of various radiation fields. So far, instruments to measure gamma rays, neutrons, and beta particles were produced. The computer capability built into these instruments provides significant computational power into the instruments. Capability unheard of a few years ago in small portable instruments is routine today. Large computer-based laboratory measurement systems which required much space and electrical power can now be incorporated in a portable hand-held instrument. The microprocessor developments at Los Alamos are now restricted to radiation monitoring equipment but can be expanded to chemical and biological applications as well. Applications for radiation monitoring equipment and others are discussed. DOE

N84-19799# Varian Associates, Palo Alto, Calif.
INFRARED MONITORING OF GYROTRON WINDOWS
H. Huey, N. Lopez, G. Hu, E. Choi, and L. Mundle 1983 10 p Presented at the IEEE Meeting, Washington, D.C., 5 Dec. 1983
(Contract W-7405-eng-26)
(DE84-004442; CONF-831257-1) Avail: NTIS HC A02/MF A01

A technique for monitoring the gyrotron output window surface temperature with an infrared camera while the gyrotron is in operation has been developed. The IR camera views the window through a perforated waveguide wall, and serves both as a guide for the safe operation at high average power of the tube, as well as an aid in the analysis of new window designs. Window temperatures were studied as a function of a number of parameters, including gun anode voltage, beam current, magnetic field, coolant flow, and load matching. The IR technique is applicable to many types of high average power microwave and millimeter wave tubes. Successful operation of the Varian 60 GHz gyrotron to 214 kW CW was guided by the infrared camera. Analyses on 28, 56 and 60 GHz gyrotrons have led to a number of design changes. A comparison with computer calculations is also presented. DOE

N84-19800# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany). Abteilung Mechanik.
COMPARISON BETWEEN VORTEX FLOWMETER AND PRESSURE FLOWMETERS Ph.D. Thesis - Technische Univ., Brunswick [DER WIRBELDURCHFLUSSMESSER IM VERGLEICH MIT WIRDRUCK-DURCHFLUSSMESSGERAETEN]
Hans-Georg Kalkhof Aug. 1983 134 p refs In GERMAN
(PTB-Me-47; ISSN-0341-6720) Avail: NTIS HC A07/MF A01

Measuring characteristic, measurement uncertainty, and pressure loss of vortex and pressure flowmeters were compared. The systematic errors due to flow sensor and Reynolds number are of the same order of magnitude. The domain in which the vortex body dimensions can be chosen is substantially smaller than the domain of opening ratio of the pressure flow sensor. The pressure loss of the vortex flowmeter is lower than that of the diaphragm, about the same as that of the nozzle, and higher than that of the Venturi tube. For the vortex flowmeter no correction factor has to be taken into account for the effect of compressibility. The measuring domain of the vortex flowmeter is larger since its characteristic is linear contrary to the quadratic characteristic of pressure flowmeters. Author (ESA)

N84-19801# Diehl G.m.b.H. und Co., Nuerenberg (West Germany).
DEVELOPMENT OF A LARGE AREA COLOR DISPLAY Final Report, Aug. 1982
Gunter Schwarz, Bruno Hampel, Werner Pauls, and Lisa Pauls

Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 89 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-206; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19

Large area (> 30 sqcm) color LCD systems are discussed, emphasizing uniformity of spacing over the whole area and sealing. Color substances, contrast, and possibility of multiplexing were investigated for dichroic displays. A double guest-host type was chosen and a display of 100 sqcm including driving electronics was developed. Test results show a nematic range minus 40 to plus 90 C, viscosity 20 to 100 CST (at 20 C), dielectric constant anisotropy > 0 (5 to 20), threshold voltage 1 to 3 V, and switching time 10 msec (at 20 C). Main applications are clocks, switching systems, and automotive systems. Author (ESA)

N84-19802# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
LINUS, A LINE-SELECTIVE EQUIPMENT FOR AGA THERMOVISION
Lars Berglund Dec. 1983 118 p refs In SWEDISH; ENGLISH summary
(FOA-C-30348-E4; ISSN-0347-3708) Avail: NTIS HC A06/MF A01; Research Institute of National Defence, Stockholm KR 50

A computer-controlled equipment for line selection, in conjunction with thermovision equipment for recording infrared images, is described. Operation and components of the circuits are reviewed. Hardware and program examples are given. No results are reported. Author (ESA)

N84-19622*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANOTHER LOOK AT THE OPTIMUM FREQUENCIES FOR A WATER VAPOR RADIOMETER
G. M. Resch *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 1-11 refs (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 14B

N84-19623*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INVERSION ALGORITHMS FOR WATER VAPOR RADIOMETERS OPERATING AT 20.7 AND 31.4 GHz
G. M. Resch *In its* The Telecommun. and Data Acquisiton Rept. 15 Feb. 1984 p 12-26 refs (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 14B

N84-19624*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN MICROWAVE ANTENNA HOLOGRAPHY
D. J. Rochblatt and B. L. Seidel *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 27-42 refs (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 14E

N84-20050# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
A CONICAL SCAN RADIOMETER FOR AN AIRPLANE MISSION
Theo Prosch, Detlef Hennings, Wen-Hwa Lin, and Ehrhard Raschke *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 44-52 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

N84-20051# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
ON THE USE OF NARROW BAND INFRARED CHANNELS TO DETERMINE THE OUTGOING LONG WAVE FLUX
Petra Landsberg and J. Schmetz *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 53-59 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-19803*# Texas Univ., Austin. Dept. of Astronomy.
THE CONSTRUCTION OF A HIGHLY TRANSPORTABLE LASER RANGING STATION Final Report
2 Nov. 1980 59 p refs
(Contract NASw-2974)
(NASA-CR-175400; NAS 1.26:175400) Avail: NTIS HC A04/MF A01 CSCL 20E

The technology of the transportable Laser Ranging Station (TLRS) used in crustal dynamics studies was examined. The TLRS used a single photoelectron beam of limited energy density returned from the Laser Geodynamic Satellite (LAGEOS). Calibration was accomplished by the diversion of a small portion of the outgoing beam attenuated to the same level as the satellite return. Timing for the system was based on a self calibrating Ortec TD811, 100 picosec time interval device. The system was contained in a modified, single chassis recreational vehicle that allowed rapid deployment. The TLRS system was only airmobile on the largest transport aircraft. A 30 cm simple plano/concave transfer lens telescope aided in beam direction. The TLRS system fulfills the need for an accurate method of obtaining range measurements to the LAGEOS satellite incorporated in a mobile, air transportable, and economical configuration. M.A.C.

N84-19804# University of Southern California, Los Angeles.
DETAILED KINETIC STUDIES OF EXCITED AND/OR TRANSIENT SPECIES Final Report, 1 Jun. 1982 - 31 May 1983
Curt Wittig Jan. 1984 17 p
(Contract N00014-82-K-0609)
(AD-A137278) Avail: NTIS HC A02/MF A01 CSCL 20/5

Subsequent to the pulsed photolytic (193 nm) production of O(3P) in the presence of CF3I, rapid consecutive reactions lead to the production of IF(X1 sigma 3). All of our measurements are consistent with IF being produced via the reactions: O + CF3I yields OI + CF3 yields F2CO + F, and F + CF3I yields IF + CF3. This route can be quite efficient, and we estimate that > 10% of the O(3P) atoms can lead to IF molecules under suitable conditions. GRA

N84-19805# Raytheon Co., Sudbury, Mass. Electro-Optics Systems Lab.
MANUFACTURING METHODS AND TECHNOLOGY (MM&T) PROGRAM. 10.6 MICROMETER CARBON DIOXIDE TEA (TRANSVERELY EXCITED ATMOSPHERIC) LASERS Final Report, 3 Apr. 1981 - 30 Jun. 1983
C. F. Luck Jun. 1983 173 p
(Contract DAAK70-81-C-0048)
(AD-A137490; ER83-4203) Avail: NTIS HC A08/MF A01 CSCL 13/8

This report documents the efforts of Raytheon Company to conduct a manufacturing methods and technology (MM&T) program for 10.6 micrometer carbon dioxide TEA lasers. A set of laser parameters is given and a conforming tube design is described. Results of thermal and mechanical stress analyses are detailed along with a procedure for assembling and testing the laser tube. Also provided are purchase specifications for optics and process specifications for some of the essential operations. Author (GRA)

N84-19806# State Univ. of New York at Buffalo, Amherst.
PLASMA MAGNETIC FIELD MEASUREMENT BY INTRACAVITY ABSORPTION Progress Report, 1 Jun. 1983 - 31 May 1984
G. O. Brink Jan. 1984 22 p refs
(Contract DE-AC02-81ER-53122)
(DE84-005152; DOE/ER-53122/2) Avail: NTIS HC A02/MF A01

Dye laser intracavity absorption (ICA) as a potential diagnostic

for plasma or neutral beam systems was studied. For magnetic field measurements it is necessary to make Zeeman effect measurements on the resonance transition of atomic lithium on a millisecond time scale. To do this it is necessary to sweep the dye laser in wavelength at a rapid rate so that the absorber can be sampled many times during the measurement. It is indicated that the ICA signal becomes small at high sweep rates limiting the rate at which such sweeping may be carried out. It may be possible to avoid this limitation by chopping the pump laser. An ICA system using a dye cell is designed, and experiments involve the observation of ICA in a ring dye laser are discussed. DOE

N84-19807# Rochester Univ., N. Y.
INERTIAL FUSION RESEARCH AT THE UNIVERSITY OF ROCHESTER: PROGRESS IN DIRECT DRIVE
R. L. McCrory 1983 23 p refs Presented at Tech. Comm. Meeting on Inertial Confinement Fusion Res., Osaka, 7 Nov. 1983
(Contract DE-AC08-80DP-40124)
(DE84-003691; DOE/DP-40124/10; CONF-831130-2) Avail: NTIS HC A02/MF A01

The Laser Energetics with both the 24 beam, 1054 nm OMEGA laser facility and the single beam, 351 nm GDL system concentrated on defining the uniformity and the physics of coronal coupling and energy transport in sperical geometry for short wavelength, direct drive laser fusion. The role of LLE in the United States inertial fusion program is reviewed. DOE

N84-19808# Purdue Univ., Lafayette, Ind. Dept. of Physics.
PROPOSAL FOR A FREE ELECTRON LASER IN THE X-RAY REGION
Roberto Colella and Alfredo Luccio (BNL) 1983 10 p refs Presented at the Topical Meeting on Free Electron Generation of Extreme Ultraviolet Coherent Radiation, Upton, N.Y., 19-22 Sep. 1983
(Contract DE-AC02-76CH-00016)
(DE84-004735; BNL-33986; CONF-8309118-6) Avail: NTIS HC A02/MF A01

It is proposed that a free electron laser can be operated in the X-ray region, in the range 2 to 3 Angstroms. An analysis is presented of the machine parameters and the characteristics of the mirrors that are required for operation in the Angstrom region. DOE

N84-19809# Sandia Labs., Albuquerque, N. Mex.
IN SITU LASER MEASUREMENTS OF SILICON CVD
W. G. Breiland and P. Ho 1984 25 p refs
(Contract DE-AC04-76DP-00789)
(DE84-004148; SAND-83-2540C) Avail: NTIS HC A02/MF A01

A variety of in-situ diagnostic methods employing lasers were used to study the fundamental chemical and physical processes that occur during the chemical vapor deposition of silicon from silane and dichlorosilane. These nonintrusive methods can detect chemical species such as reactants, products, reactive intermediates, and particulates that are present in the gas phase during CVD and can also be used to measure fluid-dynamics properties such as temperature and velocity fields. It is found that gas-phase processes are an important part of chemical vapor deposition. DOE

N84-19810# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF CO2 AND KrF GAS LASERS AS DRIVERS FOR INERTIAL CONFINEMENT FUSION
S. D. Rockwood 1983 16 p refs Presented at 10th Symp. on Fusion Engr., Philadelphia, 5 Dec. 1983
(DE84-004329; LA-UR-83-3470; CONF-831203-44) Avail: NTIS HC A02/MF A01

The optical system, power amplification, and capabilities of the Antares carbon dioxide laser facility are described. Although this facility provides 40 kJ of on-target energy from 24 beams in nanosecond pulses, attempts to developing a target design that leads to high gain (> 50) when illuminated by the laser's 10 micrometer radiation are unsuccessful. Experiments with short wavelength light show favorable trends in both increased coupling to target and reduced quantity of hot electrons. The attributes of a KrF laser are being studied as well as the development of a technique for angular multiplexing for pulse compression. A.R.H.

N84-19811# Brookhaven National Lab., Upton, N. Y.
GENERATION OF INTENSE COHERENT SOFT X-RAY WITH ELECTRON MICROBUNCHES INDUCED AND FROZEN BY LASERS
L. H. Yu 1983 18 p refs Presented at the Topical Meeting on Free Electron Generation of Extreme Ultraviolet Radiation, Upton, N.Y., 19-22 Sep. 1983
(Contract DE-AC02-76CH-00016)
(DE84-005361; BNL-34069; CONF-8309118-7) Avail: NTIS HC A02/MF A01

A new improved version of transverse optical klystron harmonic generator that uses three lasers to replace the undulators in the modulator and radiator and freeze the electron microbunching is described. It is shown that intense soft X-rays can be generated. DOE

N84-19812# California Univ., Livermore. Lawrence Livermore Lab.
FLOW VISUALIZATIONS, VELOCITY MEASUREMENTS, AND SURFACE CONVECTION MEASUREMENTS IN SIMULATED 20.8-cm NOVA BOX AMPLIFIER CAVITIES
Howard L. Julien and Edward L. Molishever 31 Oct. 1983 75 p refs
(Contract W-7405-eng-48)
(DE84-004354; UCID-19948) Avail: NTIS HC A04/MF A01

Fluid mechanics experiments performed in models of the 20.8-cm nova amplifier lamp and disk cavities are reported. Lamp cavity nitrogen flows are shown, by both flow visualization and velocity measurements, to be acceptably uniform and parallel to the flashlamps. It is shown that the nitrogen flows in the disk cavity are disordered. It is found that even though disk cavity flows are disordered, the simplest of three proposed nitrogen introduction systems for the disk cavity are acceptable, based on convection measurements made at the surfaces of simulated laser disks. DOE

N84-19872# Army Materials and Mechanics Research Center, Watertown, Mass.
MATERIALS IMPLICATIONS OF ADVANCED THERMAL AND KINETIC ENERGY THREATS
Robert Fitpatrick and John Mescall *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 71-78 refs (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/5

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-19813*# Quantum Design, Inc., San Diego, Calif.
A CONCEPTUAL DESIGN STUDY FOR THE SECONDARY MIRROR DRIVE OF THE SHUTTLE INFRARED TELESCOPE FACILITY (SIRTF) Final Report
R. E. Sager and D. W. Cox Dec. 1983 69 p refs
(Contract NAS2-11646)
(NASA-CR-166562; NAS 1.26:166562) Avail: NTIS HC A04/MF A01 CSCL 13I

Various conceptual designs for the secondary mirror actuator system to be used in the Shuttle Infrared Telescope Facility (SIRTF) were evaluated. In addition, a set of design concepts was developed to assist in the solution of problems crucial for optimum performance of the secondary mirror actuator system. A specific conceptual approach was presented along with a plan for developing that approach and identifying issues of critical importance in the developmental effort. S.L.

N84-19814*# Control Dynamics Co., Huntsville, Ala.
EFFECTS OF BEARING DEADBANDS ON BEARING LOADS AND ROTOR STABILITY Final Report
20 Jan. 1984 198 p refs
(Contract NAS8-35050)
(NASA-CR-170986; NAS 1.26:170986) Avail: NTIS HC A09/MF A01 CSCL 13I

A generic model of a turbopump, simplified to bring out these effects is examined. This model demonstrates that bearing deadbands which are of the same order of magnitude or larger than the center-of-mass offset of a rotor due to mass imbalances cause significantly different dynamic behavior than would be expected of a linear, dynamical system. This fundamentally nonlinear behavior yields altered stability characteristics and altered bearing loading tendencies. It is shown that side forces can enhance system stability in the small, i.e., as long as the mass imbalance does not exceed some thresholds value or as long as no large, impulsive disturbances cause the motion to depart significantly from the region of stability. Limit cycles are investigated in this report and techniques for determining these limit cycles are developed. These limit cycles are the major source of bearing loading and appear in both synchronous and nonsynchronous forms. The synchronous limit cycles are driven by rotor imbalances. The nonsynchronous limit cycles (also called subsynchronous whirls) are self-excited and are the sources of instability. Author

N84-19815*# Battelle Columbus Labs., Ohio.
HIGH PRESSURE OXYGEN TURBOPUMP BEARING CAGE STABILITY ANALYSES Final Report
T. L. Merriman and J. W. Kannel 8 Mar. 1984 54 p refs
(Contract NAS8-34908)
(NASA-CR-170991; NAS 1.26:170991) Avail: NTIS HC A04/MF A01 CSCL 13I

The low service life of the high pressure oxygen turbopump (HPOTP) bearings used in the space shuttle main engine was examined by use of the Battelle 'BASDAP' bearing computer stability model. The dynamic instability of the bearing cage resulted in excessive wear and eventual failure of the unit. By maintaining a cage/race clearance of no more than 0.25 millimeters (0.010 inches), ball/pocket clearance of no less than 0.54 millimeters (0.025 inches), dynamic balancing of the cages, and maintaining adequate lubricant films between the balls and races, cage instability and subsequent bearing degradation can be reduced. M.A.C.

N84-19816*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FIRST ORDER BALL BEARING KINEMATICS
Edward Kingbury (Draper (Charles Stark) Lab.) 1984 17 p refs To be presented at the Ann. Meeting of the Am. Soc. of Lubrication Engr., Chicago, 7-10 May 1984
(NASA-TM-83592; E-1918; NAS 1.15:83592) Avail: NTIS HC A02/MF A01 CSCL 13I

Two first order equations are given connecting geometry and internal motions in an angular contact ball bearing. Total speed, kinematic equivalence, basic speed ratio, and modal speed ratio are defined and discussed; charts are given for the speed ratios covering all bearings and all rotational modes. Instances where specific first order assumptions might fail are discussed, and the resulting effects on bearing performance reviewed. Author

N84-19817# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
AFTER-TEST ENGINE INSPECTION OF US ARMY ADMINISTRATIVE AND LIGHT-TACTICAL VEHICLES OPERATED ON GASOHOL AND UNLEADED GASOLINE Interim Report, Oct. 1981 - Feb. 1983
W. E. Butler, Jr., E. A. Frame, and E. C. Owens Feb. 1983 125 p
(Contract DAAK70-82-C-0001; DA Proj. 1L7-62733-AH-20)
(AD-A137312; AFLRL-167; SwRI-6800-210/1) Avail: NTIS HC A06/MF A01 CSCL 21/7

Eighteen spark ignition engines from U.S. Army administrative and light-tactical vehicles, which were part of a fleet test to determine the effects of operating such engines with gasohol as a fuel, were shipped to the U.S. Army Fuels and Lubricants Research Laboratory (USAFLRL) for after-test inspections. Twelve of the engines were operated with gasohol as a fuel, and six of the engines were operated with unleaded gasoline. Each engine was disassembled for inspections which included visual inspection, wear measurements of selected components, deposit ratings in accordance with CRC rating methods, and photographs of selected parts. No significant differences between engines operated with gasohol and those operated with unleaded gasoline could be determined by any of the inspection methods used. Consideration of the data generated from the inspections support the conclusion that gasohol may be successfully utilized in the U.S. Army's administrative and light-tactical vehicles. GRA

N84-19818# Massachusetts Inst. of Tech., Cambridge.
LUBRICATION AND SUPPORT OF A SINGLE PISTON RING
D. P. Hoult 1983 12 p refs
(Contract DE-AC02-79ER-10473)
(DE84-004368; DOE/ER-10473/T1) Avail: NTIS HC A02/MF A01

A generalized approximation scheme which is used in modeling piston ring motion, oil flow, and friction in internal combustion engines is described. Trial calculations are presented, and current weaknesses in the theory for an oil lubricated ring are discussed. A novel gas lubricated ring with a very low friction is presented. DOE

N84-19819# Cummins Engine Co., Inc., Columbus, Ind.
SYNFUEL MODIFIED DIESEL Final Report, 31 Mar. 1981 - 25 May 1982
Roy Kano, T. Yamada (Yanmar Diesel Engine Co., Osaka, Japan), and T. Nakagaki (Komatsu Ltd., Tokyo, Japan) 1982 140 p refs
(Contract DE-AC06-76RL-01830)
(DE84-002189; DOE/RL-01830/T10) Avail: NTIS HC A07/MF A01

The contemporary diesel engine, whether prechamber or direct injection, cannot burn SRC-2 fuel without modification. When SRC-2 is blended with a 50% or larger amount of standard No. 2 diesel fuel, the prechamber diesel can burn the blend with slight modification to the injection timing. The spark-assisted diesel shows remarkable improvement in diesel combustion and can handle blends as well as straight SRC-2 during operation. The adiabatic direct injection engine also demonstrates capability in burning SRC-2 fuel. However, with the spark-assisted prechamber, or with the adiabatic direct injection engine, cold start is still a problem. The emissions characteristics measured with SRC-2 fuel in the adiabatic diesel and conventional engine was similar. DOE

N84-19820# Los Alamos Scientific Lab., N. Mex.
INFLUENCE OF A PLASMA DURING LASER WELDING
R. D. Dixon and G. K. Lewis 1983 30 p refs Presented at Intern. Congr. on Appl. of Lasers and Electro-Optics, Los Angeles, Calif., 14 Nov. 1983
(Contract W-7405-eng-36)
(DE84-004414; LA-UR-83-3701; CONF-831195-4) Avail: NTIS HC A03/MF A01

High speed movies of single pulse laser welds are correlated with optical emission from the plasma and the acoustic wave to study and model enhanced coupling. The movies and acoustic signals combine to support enhanced coupling through the development of a laser supported combustion wave. DOE

N84-19821# Little (Arthur D.), Inc., Cambridge, Mass.
ASSESSMENT OF INTERNAL COMBUSTION ENGINES AS DRIVERS FOR HEAT PUMPS Final Report
Jan. 1984 78 p refs
(Contract W-7405-eng-26)
(DE84-005072; ORNL/Sub-80-13836/1-02) Avail: NTIS HC A05/MF A01

The present suitability and future potential of internal combustion engines as drivers for heat pumps was assessed for residential and light commercial machines up to 100 kW output (or approximately 50 HP input). This assessment included: a review of prior I.C. engine experience in similar applications; the determination of current engine characteristics important to heat pump systems; a conceptual design and evaluation of system economic potential and operational features; and recommended options for further development. The study showed that the internal combustion driven heat pump is technically feasible with current engine technology and that economic potential is promising for larger sizes. Developmental options recommended include: system demonstration, annual performance simulation, production cost projections and market analysis. DOE

N84-19822# Herion-Werke K.G., Stuttgart (West Germany). Regel-und Steuertechnik.
EMISSION-PROOF VALVES Final Report, Jun. 1980
Werner Koppe, Ursel Hartmann, Bernd Gohlke, and Detlef Schlosser Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 183 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-83-028; ISSN-0171-7618) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35

Emission-proof valves which use magnetic drives for control transmission into the valve housing without dynamic seals were developed for chemical plants. Magnetic conducting high-alloy and austenitic steel materials were investigated. Hardening and cold tests, tensile and bursting tests, and electron microprobe measures were performed to determine production parameters. Author (ESA)

N84-19823# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
A THEORY OF FILAMENT WOUND PRESSURE VESSELS
Th. DeJong Apr. 1983 38 p refs
(VTH-LR-379) Avail: NTIS HC A03/MF A01

A theory of filament wound pressure vessels in which a composite is considered as a material consisting of macroscopically homogeneous and anisotropic layers is presented. The surfaces of the pressure vessels can be chosen such that the requirement that all filaments carry the same load is fulfilled. The shape of the surface depends on the elastic properties of the composite and on one independent geometric parameter. Relations for characteristic properties of pressure vessels are expressed in this parameter. It is shown that the netting theory in which the matrix is considered as a non load-carrying binder can be simply derived from the continuum theory. Author (ESA)

N84-19863# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
LATERAL FORCES ON PUMP IMPELLERS: A LITERATURE REVIEW
R. D. Flack and P. E. Allaire *In* the Shock and Vibration Digest, Vol. 16, No. 1 Jan. 1984 p 5-14 refs (For primary document see N84-19862 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 13/9

N84-19919# Concordia Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
UNBALANCE RESPONSE OF A SINGLE MASS ROTOR MOUNTED ON DISSIMILAR HYDRODYNAMIC BEARINGS
R. Subbiah, R. B. Bhat, and T. S. Sankar *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 113-125 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 13/8

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-19824# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
TECHNIQUES FOR PREDICTIVE MAINTENANCE IN INDUSTRIAL INSTALLATION AND FAILURE DIAGNOSTIC
L. X. Nepomuceno 1983 49 p refs In PORTUGUESE; ENGLISH summary Presented at the 3rd Ibero-American Maintenance Congr., Rio de Janeiro, 6-11 Nov. 1983; sponsored by the Brasilian Petroleum Inst.
Avail: NTIS HC A03/MF A01

The parameters normally used for the establishment of predictive maintenance programs in industrial installations, such as temperature, pressure, lubricant analysis, mechanical vibrations and its analysis are discussed. The multiple applications of the oscilloscope as a maintenance and diagnosis tool are explored. How to evaluate the residual useful life of parts and components that present decontinuities or flaws is also covered. A.R.H.

N84-19825# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/ OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY BIBLIOGRAPHY Final Report, Jul. 1982 - Aug. 1983
Anthea M. DeVaughan Aug. 1983 187 p
(Contract MDA903-79-C-0018)
(AD-A137327; AD-E500606; IDA-D-18; IDA/HQ-83-25942) Avail: NTIS HC A09/MF A01 CSCL 05/2

This document is comprised of three sections: a subject list of the Reliability and Maintainability Study documents, a numerical list of the same documents in order of acquisition, and a list of documents used during the 1981 Defense Science Board Summer Study. The bibliography lists more than 850 documents used as source or reference material during the course of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 to August 1983. GRA

N84-19826# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
R AND M (RELIABILITY AND MAINTAINABILITY) PARAMETER ANALYSIS DOCUMENT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
Larry D. Griffin (USAF) and George A. Kern (Hughes Aircraft Co.) Aug. 1983 37 p
(Contract MDA903-79-C-0018)
(AD-A137328; AD-E500602; IDA-D-27; IDA/HQ-83-28041) Avail: NTIS HC A03/MF A01 CSCL 15/3

This document describes the four categories of R&M parameters (Readiness, Reliability, Maintainability and Manpower) used by each of the Services (Army, Navy, Air Force) for typical military systems and equipments. In addition to the descriptions of each parameter (and its subsets), its strengths and weaknesses and a discussion of each parameter are included. Typical factors and a Glossary of terms are also included. GRA

N84-19827# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
ARTIFICIAL INTELLIGENCE APPLICATIONS TO MAINTENANCE TECHNOLOGY WORKING GROUP REPORT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
Anthony Coppola (USAF) Aug. 1983 78 p
(Contract MDA903-79-C-0018)
(AD-A137329; AD-E500603; IDA-D-28; IDA/HQ-83-25944) Avail: NTIS HC A05/MF A01 CSCL 06/4

This document records the activities and presents the findings of the Artificial Intelligence Applications to Maintenance Technology Working Group, part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-19828# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
CABLING AND CONNECTORS TECHNOLOGY WORKING GROUP REPORT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
J. W. Bird (Martin Marietta Aerospace) Aug. 1983 30 p
(Contract MDA903-79-C-0018)
(AD-A137330; AD-E500604; IDA-D-29; IDA/HQ-83-28139) Avail: NTIS HC A03/MF A01 CSCL 15/3

This document records the activities and presents the findings of the Cabling and Connectors Technology Working Group, part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-19829# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
STRUCTURAL COMPOSITES TECHNOLOGY WORKING GROUP REPORT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
Frank Crossman (Lockheed Missiles and Space Co.) Aug. 1983 164 p
(Contract MDA903-79-C-0018)
(AD-A137331; AD-E500605; IDA-D-31; IDA/HQ-83-25897) Avail: NTIS HC A08/MF A01 CSCL 15/3

This document records the activities and presents the findings of the Structural Composites Technology Working Group, part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-19830# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
DIRECTED ENERGY TECHNOLOGY WORKING GROUP REPORT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
Bruce R. Mayo (Sperry Electronic Systems) Aug. 1983 184 p
(Contract MDA903-79-C-0018)
(AD-A137332; AD-E500609; IDA-D-32; IDA/HQ-83-25898) Avail: NTIS HC A09/MF A01 CSCL 15/3

This document records the activities and presents the findings of the Directed Energy Technology Working Group, part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-19831# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
FIBER OPTICS TECHNOLOGY WORKING GROUP REPORT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY. PART 1: EXECUTIVE SUMMARY Final Report, Jul. 1982 - Aug. 1983
Andrew S. Glista, Jr. (Naval Air Systems Command) and Rodney S. Katz (Naval Avionics Center) Aug. 1983 39 p
(Contract MDA903-79-C-0018)
(AD-A137333; AD-E500607; IDA-D-33-Pt-1; IDA/HQ-83-28104) Avail: NTIS HC A03/MF A01 CSCL 15/3

This document records the Executive Summary portion of the Fiber Optics Technology Working Group report, part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-19832# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
OPERATIONAL SOFTWARE TECHNOLOGY WORKING GROUP REPORT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
Lawrence E. Druffel (USAF) Aug. 1983 51 p
(Contract MDA903-79-C-0018)
(AD-A137335; AD-E500612; IDA-D-38; IDA/HQ-83-25900) Avail: NTIS HC A04/MF A01 CSCL 09/2

This document records the activities and presents the findings of the Operational Software Technology Working Group part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-19833# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
ELECTRONIC PACKAGING AND INTERCONNECT TECHNOLOGY WORKING GROUP REPORT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
Richard J. Clark Aug. 1983 103 p
(Contract MDA903-79-C-0018)
(AD-A137336; AD-E500608; IDA-D-39; IDA/HQ-83-25901) Avail: NTIS HC A06/MF A01 CSCL 09/3

This document records the activities and presents the findings of the Electronic Packaging and Interconnect Technology Working Group, part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-19834# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
MECHANICAL SYSTEMS CONDITIONING MONITORING TECHNOLOGY WORKING GROUP REPORT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
P. Howard Aug. 1983 550 p
(Contract MDA903-79-C-0018)
(AD-A137524; AD-E500614; IDA-D-36; IDA/HQ-83-25899) Avail: NTIS HC A23/MF A01 CSCL 15/3

This document records the activities and presents the findings of the Mechanical Systems Conditioning Monitoring Technology Working Group, part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-19835# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
POWER SUPPLY TECHNOLOGY WORKING GROUP REPORT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
D. Hornbeck Aug. 1983 104 p
(Contract MDA903-79-C-0018)
(AD-A137525; AD-E500615; IDA-D-40; IDA/HQ-83-28045) Avail: NTIS HC A06/MF A01 CSCL 15/3

This document records the activities and presents the findings of the Power Supply Technology Working Group, part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through 1983. GRA

N84-19836# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
TESTING TECHNOLOGY WORKING GROUP REPORT IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
G. W. Neumann Aug. 1983 136 p

(Contract MDA903-79-C-0018)
(AD-A137526; AD-E500613; IDA-D-41; IDA/HQ-83-25924) Avail: NTIS HC A07/MF A01 CSCL 15/3

This document records the activities and presents the findings of the Testing Technology Working Group, part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-19837# Sandia Labs., Albuquerque, N. Mex.
ALTERING THE APPLICATION OF THE TRADITIONAL SYSTEMS LIFECYCLE
J. R. Schofield, Jr. 4 Oct. 1983 15 p refs Presented at USE Conf., Orlando, Fla., 4 Oct. 1983
(Contract DE-AC04-76DP-00789)
(DE84-000052; SAND-83-1376C; CONF-8310211-2) Avail: NTIS HC A02/MF A01

The following material examines many of the issues which face the systems analyst today. An argument for altering the system's development process is constructed. Maintenance is briefly mentioned to reveal the common attributes between some maintenance tasks and development work. Although economic benefits justify altering the development approach, intangible benefits are realized as well. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-19838# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 15, NO. 5 Monthly Report
Judith Nagle-Eshleman, ed. May 1983 88 p refs
(AD-A131729) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Turbomachine blade vibration and dynamic applications of piezoelectric crystals are discussed. For individual titles, see N84-19839 through N84-19840.

N84-19839# Indian Inst. of Tech., New Delhi.
TURBOMACHINE BLADE VIBRATION
J. S. Rao *In* the Shock and Vibration Digest, Vol. 15, No. 5 May 1983 p 3-10 refs (For primary document see N84-19838 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The literature since 1979 on free vibrations and excitation forces of blades and blade response is reviewed. Author

N84-19840# Technical Univ. of Istanbul (Turkey).
DYNAMIC APPLICATIONS OF PIEZOELECTRIC CRYSTALS. PART 3: EXPERIMENTAL STUDIES **c76**
M. C. Doekmeci *In* the Shock and Vibration Digest, Vol. 15, No. 5 May 1983 p 11-22 refs (For primary document see N84-19838 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/2

Current open literature pretaining to the dynamic applications of piezoelectric crystals is reviewed. Representative theoretical and experimental papers cover waves and vibrations in piezoelectric one-dimensional and two-dimensional structural elements. New trends of research are pointed out for future applications of piezoelectric crystals. Author

N84-19841# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 15, NO. 6 Monthly Report
Judith Nagle-Eshleman, ed. Jun. 1983 101 p refs
(AD-A131730) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Subject matter covered includes: nonlinear vibration of plates; mechanical signature analysis; and static and dynamic behavior of mechanical components associated with electrical transmission lines. For individual titles, see N84-19842 through N84-19844.

N84-19842# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mechanical and Industrial Engineering.
NONLINEAR VIBRATIONS OF PLATES: A REVIEW
M. Sathyamoorthy *In* the Shock and Vibration Digest, Vol. 15, No. 6 Jun. 1983 p 3-17 refs (For primary document see N84-19841 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The survey of literature presented in this paper on nonlinear vibrations of plates is limited to papers published from 1979 to 1983. Geometric, material, and combinations of these nonlinearities are treated; complicating effects of anisotropy, attached masses, cutouts, elastic foundation, nonclassical boundary conditions, stiffeners, thermal stresses, variable thickness, traverse shear deformation, and rotary inertia are also surveys. Author

N84-19843# Vermont Univ., Burlington.
MECHANICAL SIGNATURE ANALYSIS
M. S. Hundal *In* the Shock and Vibration Digest, Vol. 15, No. 6 Jun. 1983 p 19-26 refs (For primary document see N84-19841 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Mechanical signature analysis encompasses the analysis of dynamic signals from machines and processes for the purposes of testing, monitoring, diagnostics, and system identification and modification. Literature in this field from 1980 through 1982 is reviewed in this paper. Author

N84-19844# Manitoba Univ., Winnipeg.
STATIC AND DYNAMIC BEHAVIOR OF MECHANICAL COMPONENTS ASSOCIATED WITH ELECTRICAL TRANSMISSION LINES
P. G. S. Trainor, N. Popplewell, A. H. Shah, and R. B. Pinkney *In* the Shock and Vibration Digest, Vol. 15, No. 6 Jun. 1983 p 27-38 refs (For primary document see N84-19841 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

This article describes the behavior of transmission towers, insulator strings, conductors, and foundations as determined from theoretical analyses, model testing, and full-scale tests. Line vibration is also briefly reviewed. Author

N84-19845# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 15, NO. 7 Monthly Report
Judith Nagle-Eshleman, ed. Jul. 1983 97 p refs
(AD-A132576) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Advances in shock and vibration technology are outlined. Topics discussed include: instability of circular cylinder arrays in cross flow; nonstationary resonance oscillations; and industrial noise control. For individual titles, see N84-19846 through N84-19848.

N84-19846# Brueel and Kjaer Instruments, Inc., Gaithersburg, Md.
INDUSTRIAL NOISE CONTROL: THE PAST THREE YEARS **c71**
R. J. Peppin *In* the Shock and Vibration Digest, Vol. 15, No. 7 Jul. 1983 p 3-15 refs (For primary document see N84-19845 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/1

Industrial noise control over the past 3 years is reviewed.

Broad categories are presented because of the encompassing nature of the areas. E.A.K.

N84-19847# Argonne National Lab., Ill. Components Technology Div.
INSTABILITY OF CIRCULAR CYLINDER ARRAYS IN CROSS FLOW **c34**
S. S. Chen *In* the Shock and Vibration Digest, Vol. 15, No. 7 Jul. 1983 p 17-26 refs (For primary document see N84-19845 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/4

Developments in dynamic instability of circular cylinder arrays subjected to cross flow are reported. Progress since 1980 is reported; mathematical models, experimental data, stability criteria, design guidelines, and future research needs are discussed.E.A.K.

N84-19848# International Telecommunications Satellite Organization, Washington, D. C.
NONSTATIONARY RESONANCE OSCILLATIONS
B. N. Agrawal and R. M. Evan-Iwanowski (Syracuse Univ.) *In* the Shock and Vibration Digest, Vol. 15, No. 7 Jul. 1983 p 27-33 refs (For primary document see N84-19845 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Nonstationary oscillations in combination resonances, factors affecting nonstationary responses, and applications and unsolved problems of nonstationary responses are described. E.A.K.

N84-19849# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 15, NO. 8 Monthly Report
Judith Nagle-Eshleman, ed. Aug. 1983 86 p refs
(AD-A133708) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Equivalence techniques for vibration testing are discussed. Different tests are surveyed. Vibration exposure is discussed. Stability problems of rotor systems and general vibration problems due to free and forced vibrations are discussed. Abstracts are given on such topics as acoustic excitation, structural analysis, shafts, and pumps. For individual titles, see N84-19850 through N84-19851.

N84-19850# New South Wales Univ., Kensington (Australia). School of Electrical Engineering and Computer Science.
EQUIVALENCE TECHNIQUES FOR VIBRATION TESTING
H. S. Blanks *In* the Shock and Vibration Digest, Vol. 15, No. 8 Aug. 1983 p 3-11 refs (For primary document see N84-19849 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A survey covering the literature from 1980 to 1982 for producing, evaluating, and utilizing equivalence techniques in field and laboratory vibration testing is given. Different forms of laboratory testing are also surveyed. Screening by vibration exposure is included although its purpose is not the reproduction of field vibration. R.J.F.

N84-19851# Kobe Univ. (Japan).
STABILITY PROBLEMS OF ROTOR SYSTEMS
T. Iwatsubo *In* the Shock and Vibration Digest, Vol. 15, No. 8 Aug. 1983 p 13-24 refs (For primary document see N84-19849 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A review of the literature published from 1980 to 1982 on vibration problems in rotor dynamics, especially instability problems is given. Included are general vibration problems and theoretical and numerical approaches to free and forced vibrations; vibration problems of turbines, compressors, pumps, and bearings; flow-induced forces due to seals and impellers; parametric excitations due to couplings and unsymmetric stiffness of rotor shafts; torsional vibration; gears; monitoring (diagnosis); and control. R.J.F.

N84-19852# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 15, NO. 12 Monthly Report
R. L. Eshleman, ed. Dec. 1983 168 p refs
(AD-A138158) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Vehicle-structure interactions in bridge dynamics, vibrations overhead transmission lines IV, book reviews, and abstracts are provided. For individual titles, see N84-19853 through N84-19854.

N84-19853# Purdue Univ., Lafayette, Ind.
VEHICLE-STRUCTURE INTERACTIONS IN BRIDGE DYNAMICS
E. C. Ting and M. Yener *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 15, No. 12 Dec. 1983 p 3-10 refs (For primary document see N84-19852 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Recent developments in analytical and numerical approaches for solving vehicle-guideway interaction problems are discussed; related recent literature is cited. In addition, recently reported relevant experimental developments are presented. Author

N84-19854# Waterloo Univ. (Ontario).
VIBRATION OF OVERHEAD TRANSMISSIONS LINES 4
R. N. Dubey and C. Sahay *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 15, No. 12 refs (For primary document see N84-19852 10-39)
Avail: SVIC, Dode 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Recent literature published in various areas related to vibration of overhead transmission lines is described. Topics include wind loading, aeolian vibration, wake-induced oscillation, galloping, and damping. Author

N84-19855# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 15, NO. 10 Monthly Report
Judith Nagle-Eshleman, ed. and Loretta G. Twohig, ed. Oct. 1983 93 p refs
(AD-A136898) Avail: SVIC, Code 5806, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The organization, distillation, and review of the literature in the shock and vibration area are presented. Articles dealing with specialized technology but written for the nonspecialist are prepared. These critical reviews of the literature and extensive bibliographies are presented as a help to the specialist and those researchers beginning work in this area. Also included are abstracts from current literature. For individual titles, see N84-19856 through N84-19857.

N84-19856# National Aerospace Lab., Tokyo (Japan).
SHOCK AND SEISMIC RESPONSE SPECTRA IN DESIGN PROBLEMS
Y. Matsuzaki and S. Kibe *In* the Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 15, No. 10 Oct. 1983 p 3-10 refs (For primary document see N84-19855 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Recent literature on shock and seismic response spectra techniques are reviewed. Applications of shock response spectra in design problems are discussed. Description of determinations of seismic response spectra from recorded ground motions are also given. Author

N84-19857# Florida Univ., Gainesville. Dept. of Engineering Sciences.
IMPACT LOADING IN FILAMENTARY STRUCTURAL COMPOSITES **c24**
R. L. Sierakowski and S. K. Chaturvedi *In* the Shock and Vibration

Information Center The Shock and Vibration Digest, Vol. 15, No. 10 Oct. 1983 p 13-31 refs (For primary document see N84-19855 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 11/4

The impact loading response of filamentary type composite materials is summarized. The following types of composites are included: boron-fiber, chopped-fiber, glass-fiber, graphite or carbon-fiber, hybrids, Kevlar-fiber with polymer matrix, and metal-matrix. Author

N84-19858# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 15, NO. 11 Monthly Report
Judith Nagle-Eshleman, ed. and Loretta G. Twohig, ed. Nov. 1983 91 p refs
(AD-A137065) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Information obtained in evaluating dampers is given in this report. The dynamic behavior of underground structures is discussed and information is presented on the stable response of damped linear systems. For individual titles, see N84-19859 through N84-19861.

N84-19859# Central Power Research Inst., Bangalore (India).
A TECHNICAL NOTE ON EVALUATION OF DAMPERS
T. V. Gopalan *In* the Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 15, No. 11 Nov. 1983 p 3-4 (For primary document see N84-19858 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington D.C. 20375 CSCL 20/11

The significance of the inverse standing wave ratio (ISWR) test and its role in assessing dampers and in obtaining other information needed for their evaluation are discussed in this technical note. Author

N84-19860# State Univ. of New York, Buffalo. Dept. of Civil Engineering.
DYNAMIC BEHAVIOR OF UNDERGROUND STRUCTURES
G. D. Manolis *In* the Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 15, No. 11 Nov. 1983 p 7-18 refs (For primary document see N84-19858 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

This article has two purposes: (1) to provide a brief historical perspective to the general subject of dynamic behavior of underground structures and (2) to summarize the work done in this area during the last few years. Underground structures can be close to the surface or deeply buried and can be subjected to harmonic, shock, or seismic excitations. Experimental, analytical, and numerical methods of approach are discussed. Author

N84-19861# Naval Surface Weapons Center, White Oak, Md.
STABLE RESPONSE OF DAMPED LINEAR SYSTEMS
D. W. Nicholson and D. J. Inman (State Univ. of New York, Buffalo) *In* the Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 15, No. 11 Nov. 1983 p 19-25 refs (For primary document see N84-19858 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

This paper updates and expands a previous review concerned with several aspects of the response of damped mechanical systems. Topics include asymptotic stability, oscillation conditions, forced response bounds, and eigenvalue localization. Considerable progress has been made on the last three topics but little on the first. Several simple new results are stated. Author

N84-19862# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 16, NO. 1 Monthly Report
Judith Nagle-Eshleman, ed. Jan. 1984 115 p refs
(AD-A137502) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The feature articles address lateral forces on pump impellers, underwater acoustics modeling, and eigenvalue methods for vibration analysis. Book and synposia reviews, course descriptions, and a bibliography with abstracts are also included. For individual titles, see N84-19863 through N84-19865.

N84-19863# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
LATERAL FORCES ON PUMP IMPELLERS: A LITERATURE REVIEW c37
R. D. Flack and P. E. Allaire *In* the Shock and Vibration Digest, Vol. 16, No. 1 Jan. 1984 p 5-14 refs (For primary document see N84-19862 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 13/9

Previous research regarding hydraulically generated lateral forces in pumps is critically reviewed. Included are both theoretical and experimental work. Flows in impellers and volutes are considered, as are pressures and forces arising from orbiting impellers and blade passing. Author

N84-19864# Ocean Data Systems, Inc., Rockville, Md.
UNDERWATER ACOUSTIC MODELING TECHNIQUES c71
P. C. Etter *In* the Shock and Vibration Digest, Vol. 16, No. 1 Jan. 1984 p 17-23 refs (For primary document see N84-19862 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/1

Progress in the area of underwater acoustic modeling techniques since 1980 is reviewed. Emphasis is placed on developments of general interest to the Navy sonar modeling community. They include: model refinements, bottom interaction modeling, model operating systems and trainers, and specialized modeling applications in shallow water and Arctic environments. Author

N84-19865# Queens Univ., Belfast (Northern Ireland).
EIGENVALUE METHODS FOR VIBRATION ANALYSIS 2
A. Jennings *In* the Shock and Vibration Digest, Vol. 16, No. 1 Jan. 1984 p 25-33 refs (For primary document see N84-19862 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Methods for solving dynamic equations to determine characteristic response are reviewed. In particular numerical methods for eigensolution as they apply to the analysis of undamped or damped systems are considered. Author

N84-19866# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION BULLETIN. PART 1: WELCOME, KEYNOTE ADDRESS, INVITED PAPERS, PYROTECHNIC SHOCK, AND SHOCK TESTING AND ANALYSIS Monthly Report
May 1983 196 p refs Proc. of the 53d Symp. on Shock and Vibration, Danvers, Mass., 26-28 Oct. 1982 4 Vol.
(AD-A134452; SVIC-Bull-53-Pt-1) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Interchange of information in the shock and vibration field between government, industry and universities is stressed. Topics of discussion included pyrotechnic shock, shock testing, shock analysis, and aircraft survivability. For individual titles, see N84-19867 through N84-19880.

N84-19867# Army Aviation Research and Development Command, St. Louis, Mo.
AVRADCOM RESEARCH HELICOPTER VIBRATION c05
Story C. Stevens *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 3-20 refs (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01/3

Since the maiden flight in 1940, the Army helicopter has encountered a multitude of vibration problems. These problems have decreased system productivity and increased life cycle costs. Improvements were achieved, for the most part, by add-on vibration control devices designed to reduce rotor vibratory loads and airframe vibrations. Numerous vibration related problems still persist in the design of the modern helicopter. Today's vibration problems are more critical due to changes in overall mission requirements which include: nap-of-the-earth and high speed flight, advanced weapons delivery, survivability, transportability, high reliability, and low maintenance. Research efforts are directed towards vibration analysis, vibration control and vibration testing. Author

N84-19868# Shock and Vibration Information Center (Defense), Washington, D. C.

TECHNICAL INFORMATION SUPPORT FOR SURVIVABILITY **c81**

H. C. Pusey, R. H. Volin, and J. G. Showalter *In its* The Shock and Vibration Bull., Part 1 May 1983 21-31 (For primary document see N84-19866 10-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 05/1

DoD policy requires that system survivability be a major consideration in the systems acquisition process. The need for an effective DoD survivability/vulnerability information service is established. The technology sources and the user community are examined and options are discussed for the organization of the information service. Recommendations are offered on the steps to take for the establishment of such a service. Author

N84-19869# Joint Technical Coordinating Group for Aircraft Survivability, Washington, D.C.

AIRCRAFT SURVIVABILITY **c05**

Dale B. Atkinson *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 33-38 (For primary document see N84-19866 10-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01B

Survivability is defined by the NAVMAT Combat Survivability Instruction (NAVMATINST 3900.16) as the capability of a weapon system to continue to carry out its mission in a hostile threat environment and is a function of both susceptibility and vulnerability. Susceptibility takes into account those factors that determine whether the aircraft is hit by a threat and vulnerability takes into account those factors that determine whether the aircraft is killed by the threat mechanisms if it is hit. An overview of the Naval Air Combat Survivability Program and selected activities of the Tri-Service Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) is presented. Author

N84-19870# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

VIBRATION CHALLENGES IN MICROELECTRONICS MANUFACTURING **c33**

Eric E. Ungar and Colin G. Gordon *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 51-58 (For primary document see N84-19866 10-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 09/3

The manufacture of smaller, more tightly packed, integrated circuits requires facilities designed to meet stringent vibration requirements. Vibration control is complicated by the need for extensive process support equipment and some service personnel in the vicinity of the sensitive machines. Facility criteria that were developed on the basis of earlier facility experience have tended to be unrealistic and inadequately defined. The shortcomings of these criteria are delineated and indicates how better criteria may be defined. Information on vibration levels that are permissible for critical items of optical equipment is essential to the development of realistic facilities criteria. The limitations of some of the available data are discussed, together with suggestions for overcoming them and for improving optical equipment items from the standpoint of their structural dynamics. Author

N84-19871# Naval Ship Research and Development Center, Bethesda, Md.

THE EVOLUTION OF SPECTRAL TECHNIQUES IN NAVY SHOCK DESIGN

Gene Remmers *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 59-70 refs (For primary document see N84-19866 10-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The 50th anniversary of Maurice A. Biot's initial development of spectral techniques to calculate stresses in structures which are subjected to dynamic loads from transient motion excitation is commemorated. The evolution of this basic and very important work to U.S. Navy shock design applications is described in three parts. The first part is principally a historical account of Dr. Biot's contributions covering his Ph.D. thesis in 1932 (1), the mechanical analyzer in 1941 (2), and the application to engineering seismology in 1942 (3). The second part describes the U.S. Navy shock design methods of the 1940's, including the initial application of Biot's approach in 1948. The subsequent discovery by the Navy of the importance of and proper accounting for equipment-ship interaction effects is covered. The third part describes how this application was refined during Navy shock design development from 1959 to the present. Author

N84-19872# Army Materials and Mechanics Research Center, Watertown, Mass.

MATERIALS IMPLICATIONS OF ADVANCED THERMAL AND KINETIC ENERGY THREATS **c36**

Robert Fitpatrick and John Mescall *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 71-78 refs (For primary document see N84-19866 10-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/5

The behavior of materials subjected to laser radiation rather than issues of target acquisition, pointing and tracking, fire control, and damage recognition are discussed. These target acquisition and fire control requirements represents extremely difficult technological problems that must be solved if the Laser is ever to be used as a weapon against hard targets. Questions that must be resolved are outlined as follows: Can laser beams be propagated over large distances along predictable paths? Can available active and passive countermeasures be overcome? Is there a place for large scale, high power, high value directed energy weapons on the battlefield? While these questions are being addressed, the Army materials community is developing a data base on materials and structures vulnerability. This data base will not only serve the hardening community, which has the task of offering protection against directed energy, but also will help the weapon developers determine the effectiveness of their systems. Author

N84-19873# Martin Marietta Aerospace, Orlando, Fla.

PYROTECHNIC SHOCK TEST AND TEST SIMULATION **c28**

M. E. Hughes *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 83-88 ref (For primary document see N84-19866 10-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 19/1

Mechanical shock was measured at 18 locations during 5 ground tests of flight vehicle structures. The shock was generated by a linear shaped charge (LSC) cutting 0.063-in. aluminum skin to separate a reentry vehicle from a booster. Of the 3 tests, 4 used 10 grains/ft and 1 used 12.5 grains/ft. A maximum shock response spectra of 32,000 g was measured 5 in. from the LSC cutting plane. The data were statistically treated to define the source environment and distance attenuation. A pyro shock simulation fixture was developed for equipment testing. Author

N84-19874# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

STRAIN HISTORIES ASSOCIATED WITH STAGE SEPARATION SYSTEMS USING LINEAR SHAPED CHARGE **c28**

D. R. Powers *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 89-96 refs (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 19/1

A series of design optimization tests were performed on subscale and full-scale vehicle interstage separation systems. Aluminum sheathed, 30 grain/foot, linear shaped charge (ALSC), was used to cut 1-1/2 by 3 foot panels and 8-foot-diameter 6-foot-high cylindrical sections. Acceleration and strain histories and shock response spectra are presented from representative firings. Recorders were run in both the direct and FM modes giving frequency responses of 600 kHz and 80 kHz respectively. Shock response spectra amplitudes exceeding 200,000 g plotted to 100 kHz and strain histories exceeding 80,000 micron in./in. at rates greater than 3,000 in./in/sec are shown. Author

N84-19875# Morrow (Charles T.), Encinitas, Calif.
SHOCK SPECTRAL ANALYSIS BY PERSONAL COMPUTER, USING THE IFT ALGORITHM c61
Charles T. Morrow *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 97-102 refs (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 09/2

In the environmental specification as a technical management tool, the undamped residual shock spectrum (as opposed to damped or undamped maximax) is the primary mode of spectral analysis for shock. The only specific objection raised thus far to conforming to this in environmental specifications is that no instrument is yet commercially available to perform the spectral computations. Conversely, no instrument manufacturer would be sure enough of a market to develop such an instrument before the undamped residual is recognized by specifications. Partly as a step to resolve this, progress in the development of a program for personal computers, based on an algorithm that is comparable in practice to the FFT in computation time but much less demanding of computer memory is reported. The current program is designed for 301 logarithmically spaced frequencies and deals with phase as well as magnitude in plottable form. Author

N84-19876# Sandia Labs., Albuquerque, N. Mex.
AN EXPLOSIVE DRIVEN SHOCK TUBE FOR VERIFYING SURVIVAL OF RADIOISOTOPE HEAT SOURCES DURING SPACE SHUTTLE LAUNCH ACCIDENT c14
F. H. Mathews *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 103-115 refs (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 14/2

Decay of radioactive isotopes provides a heat source for flights into deep space. Environmental concerns dictate that these heaters retain and immobilize their toxic contents in the event of a space shuttle detonation on the launch pad. The planning, conduct, and analysis of experiments which employed explosive driven shock tubes to simulate such a blast are described. Trials were conducted using a 102 mm diameter tube filled with air with an attached expendable driver section containing explosive. Analysis indicated dimensionless parameters which allowed scaling of pressure and impulse data to design of a larger shock tube, although this was complicated by distortion due to the greater relative roughness of the large tube. Scale results were used to design a 0.3 m diameter by 18 m tube driven by 74 kg of Composition C-4 plastic explosive to produce the 14 MPa (2000 psi) static overpressure and 37 kPa.s (5.4 psi.s) impulse for the heat source survivability tests. Author

N84-19877# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF MEASUREMENT SYSTEM PHASE RESPONSE ON SHOCK SPECTRUM COMPUTATION
Patrick L. Walter *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 133-142 refs (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A shock spectrum is the envelope of peak responses of an infinite number of single degree of freedom linear oscillators to an input transient. The shock spectrum provides a technique to assess the results of different shock stimuli by comparing the similarities in peak responses they elicit from the assemblage of oscillators. The principal application of the shock spectrum in aerospace technology is to permit component shock test specifications to be generated independent of specific time histories. Computation of a shock spectrum first depends on a successful measurement of the transient acceleration time history a component experiences in application. Acceleration measurement systems are described as low pass filters; i.e., systems which pass frequencies from at or near 0 Hz to some upper frequency limit. This upper frequency limit, typically characterized by 3 dB attenuation, is due to constraints in the bandwidth of the analog signal conditioning amplifiers, filtering due to distributed cable capacitance, anti-aliasing filters designed into digital systems, or analog filters associated with FM demodulators. Author

N84-19878# Computer Sciences Corp., Houston, Tex.
EFFICIENT ALGORITHMS FOR CALCULATING SHOCK SPECTRA ON GENERAL PURPOSE COMPUTERS c61
Frank W. Cox *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 143-161 (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 09/2

Standard shock spectral analysis is merely a problem in the time domain; thus, transform methods such as the FFT are both slow and superfluous on general purpose hardware. The solution to the differential equation is written in ways that are formally exact. What was neglected in traditional computation is that recursive algorithms are devised that circumvent numerous evaluations of transcendental functions. Further, shock spectra often exhibit minor oscillations other than the obvious peaks expected at resonant frequencies. These secondary oscillations are theoretically legitimate. Author

N84-19879# Sandia Labs., Albuquerque, N. Mex.
EVALUATION AND CONTROL OF CONSERVATISM IN DROP TABLE SHOCK TESTS
Thomas J. Baca *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 163-176 refs (For primary document see N84-19866 10-39)
(Contract DE-AC04-76DP-00789)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Absolute acceleration shock spectra are the most common means of characterizing mechanical shock. These shock spectra are of limited use in making a quantitative evaluation of the conservatism contained in a laboratory shock test. A technique for evaluating and controlling the conservatism in drop table shock tests is presented. Alternative characterizations of shock transients are introduced which compensate for the limitations of absolute acceleration shock spectra in representing shock environments. A method of analyzing both field and laboratory shock environments is developed which is used for any type of shock characterization to account for the variability in the description of the environments. An index of conservatism (IOC) is defined which quantifies conservatism between the field and laboratory shock environments. The IOC can be calculated for any response characteristic of interest. Author

N84-19880# Rockwell International Corp., Downey, Calif.
ICE IMPACT TESTING OF SPACE SHUTTLE THERMAL PROTECTION SYSTEM MATERIALS c16
Paul H. DeWolfe *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 177-182 (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 22/2

An ice impact test program is currently in progress to evaluate the damage resistance of the various Space Shuttle thermal protection system materials when subjected to impact by ice projectiles shed from the external tank during ascent. This program required the development of a test method before material evaluation could begin. The development of the test method, as well as progress in material testing during 1982, are provided. Descriptions of the impact, including ice source velocity, incidence angle, and location are included. Five significant conclusions were drawn to date and are reported. The direction taken for future testing is also described. Author

N84-19881# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION BULLETIN. PART 2: FLUID-STRUCTURE DYMANICS AND DYNAMIC ANALYSIS Monthly Report
May 1983 157 p refs Proc. of the 53d Symp. on Shock and Vibration, Danvers, Mass., 26-28 Oct. 1982 4 Vol.
(AD-A134453; SVIC-Bull-53-Pt-2) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Work influence structure dynamics are reported. Partial Contents: experimental validation of the component synthesis method for predicting vibration of liquid filled piping; acoustic responses of coupled fluid structure system by acoustic structural analog; fluid structure interaction by the method of characteristics; a solution to the axisymmetric and one dimensional bulk cavitation problem; dynamic simulation of structural systems with nonlinear components; experimental and analytical investigation of active loads control for aircraft landing gear; modal identification of multiple degree of freedom systems from experimental data; an application of the kinetic energy calculation as an aid in mode identification; dynamics of a simple system subjected to random impact; approximate numerical predictions of impact induced structural responses; face shear vibrations of contoured crystal plates; and dynamic behavior of composite layered beams by the finite element method. For individual titles, see N84-19882 through N84-19892.

N84-19882# Michigan State Univ., East Lansing.
EXPERIMENTAL VALIDATION OF THE COMPONENT SYNTHESIS METHOD FOR PREDICTING VIBRATION OF LIQUID-FILLED PIPING c34
F. J. Hatfield, D. C. Wiggert, and L. C. Davidson (Naval Ship Research and Development Center) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 1-10 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/4

Vibration of piping which can be caused by pulsation of contained liquid are discussed. Accurate prediction of such vibration requires consideration of the effect of pipe motion on fluid oscillation, and of acoustic pressure on pipe walls. Component synthesis is an analytic technique that approximates those interactions by synthesis of plane wave acoustics of the liquid and normal modes analysis of the pipe structure. Results of analysis by component synthesis are compared to solutions of partial differential equations of motion and to experimental observations for two example pipe configurations. Simplifying assumptions common to the two analyses are examined. E.A.K.

N84-19883*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACOUSTIC RESPONSES OF COUPLED FLUID-STRUCTURE SYSTEM BY ACOUSTIC-STRUCTURAL ANALOGY c71
Y. S. Shin (Naval Postgraduate School) and M. K. Chargin *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 11-21 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/1

The use of an analogy between structural mechanics and acoustics makes it possible to solve fluid-structural interaction (FSI) problems using an existing structural analysis computer program. This method was implemented in MSC/NASTRAN program and the FSI analysis was performed using two dimensional coupled fluid beam model to assess and evaluate the adequacy of this approach. The coupled modal analysis of 3-D model is also briefly discussed. The normal mode, modal frequency response and transient response analysis of 2-D coupled fluid beam system is presented. The significant reduction of the acoustic pressure response at the fluid structure interface is observed as a result of fluid structure interaction. E.A.K.

N84-19884# Naval Surface Weapons Center, White Oak, Md.
FLUID-STRUCTURE INTERACTION BY THE METHOD OF CHARACTERISTICS c34
Franklin D. Hains *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 23-32 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/4

Linearized formulations for the pressure loading on submerged structures are inadequate when applied to impulsive loads from strong underwater shock waves. The limitations are discussed and a new approach based on the method of characteristics is presented. A nonlinear, exact relation is obtained for the pressure loading on a compliant structure produced by a plane shock wave. The characteristics in the physical and state planes are described for the interaction of three dimensional, curved shock fronts with a structure. An approximate, nonlinear relation is obtained for impulsive shock loading on compliant surfaces by curved shocks. E.A.K.

N84-19885# Clarkson Coll. of Technology, Potsdam, N.Y.
DYNAMIC SIMULATION OF STRUCTURAL SYSTEMS WITH ISOLATED NONLINEAR COMPONENTS
Levon Minnetyan, John A. Lyons (Niagara Mohawk Power Corp.), and Tony G. Gerardi (AFWAL) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 63-77 refs (For primary document see N84-19881 10-39)
(Grant AF-AFOSR-0216-82)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Nonlinear constitutive relationships in one or more of the structural elements which necessitate a time history integration of the equations of motion for the entire structure. Time history analysis is usually carried out in terms of a limited number of generalized modal coordinates for the elastic substructures. A limited modal content, however, is not sufficient to simulate the detailed structural response. To overcome this drawback a new hybrid method is formulated for the detailed dynamic analysis of complex structures. The new solution procedure incorporates a time history analysis of the nonlinear response with a frequency domain analysis of the linear modes. The frequency domain analysis uses a larger number of modal coordinates to realistically simulate the details of structural response. The basic modal decoupling assumption of the hybrid method is studied by numerical application of the method to a simple elastic vehicle with nonlinear suspension properties, taxing over an irregular profile. E.A.K.

N84-19886*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF ACTIVE LOADS CONTROL FOR AIRCRAFT LANDING GEAR c05
David L. Morris (AFWAL) and John R. McGehee *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 79-89 (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01/3

A series hydraulic, active loads control main landing gear from a light, twin-engine civil aircraft was investigated. Tests included landing impact and traversal of simulated runway roughness. It is shown that the active gear is feasible and very effective in reducing the force transmitted to the airframe. Preliminary validation of a multidegree of freedom active gear flexible airframe takeoff and

landing analysis computer program, which may be used as a design tool for active gear systems, is accomplished by comparing experimental and computed data for the passive and active gears. E.A.K.

N84-19887# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Materials Lab.
ON THE MODAL IDENTIFICATION OF MULTIPLE DEGREE OF FREEDOM SYSTEMS FROM EXPERIMENTAL DATA
David I. G. Jones and Agnieszka Muszynska (Bently Nevada Corp.) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 91-110 refs (For primary document see N84-19881 10-39)
(AF Proj. 2307)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The relative merits of frequency doman modal indentification procedures using receptance and structural dynamic stiffness representations of measured structural response data are discussed. It is shown that, while the receptance repesentation leads to adequate and easily obtained parameters for systems having low damping and stiffness characteristics which vary slowly with frequency, the dynamic stiffness representation has distinct advantages when the system is nonconservative and/or has characteristics which vary rapidly with frequency. E.A.K.

N84-19888# Hughes Helicopters, Culver City, Calif.
APPLICATION OF THE KINETIC ENERGY CALCULATION AS AN AID IN MODE IDENTIFICATION
J. J. Brown and G. R. Parker *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 111-123 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The ability to economically and efficiently solve large order finite element dynamic problems has become a reality. The task of modal identification, however, has proportionately increased. By applying the kinetic energy calculation to the modal data, candidates for structural and local modes and possible modeling errors can be quickly isolated. This technique was applied during the analysis of the Hughes Advanced Attack Helicopter (AAH). The obvious advantages offered by this method are shown. E.A.K.

N84-19889# State Univ. of New York at Buffalo, Amherst. Dept. of Civil Engineering.
DYNAMICS OF A SIMPLE SYSTEM SUBJECTED TO RANDOM IMPACT
T. T. Soong *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 125-129 refs (For primary document see N84-19881 10-39)
(Grant NSF CEE-80-10891)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The impact characteristics of a simple mechanical system subjected to random collision or impact were examined. The model is a one degree of freedom mechanical system oscillating between two elastic reflectors when the supporting frame is subjected to a base motion modeled by a stationary random process. The statistical properties of the maximum force of impact when impact occurs and of the time to impact are investigated. Results are presented in a form so that they can be readily applied to the design of the restraining system for the oscillator as well as the reflectors. E.A.K.

N84-19890# Lockheed Missiles and Space Co., Sunnyvale, Calif.
APPROXIMATE NUMERICAL PREDICTIONS OF IMPACT-INDUCED STRUCTURAL RESPONSES
Richard W. Wu *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 131-138 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The collision force or the collision imparted velocity method are evaluated. The limitations and advantages of the two methods are assessed via several numerical examples. The sliding behavior where the usual concept of friction is used is considered. The collision imparted velocity method is more versatile and less suspectible to numerical difficulty than the collision force method for the high velocity impact and for structures with high local identation rigidity. The collision force method may be used very efficiently for the case of low velocity impact and/or low indentation rigidity. E.A.K.

N84-19891# National Research Inst., Bankura (India).
ON THE FACE-SHEAR VIBRATIONS OF CONTOURED CRYSTAL PLATES c76
Sasadhar De *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 139-149 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/2

The face shear vibration characteristics of monoclinic crystal plates of verying thickness are generalized and the special features of the frequency spectrum are shown. Solution for a crystal plate with piece wise continuous boundary is obtained. The results are compared with those obtained for a plate of uniform thickness. E.A.K.

N84-19892# Institut National des Sciences Appliquees de Lyon, Villeurbanne (France). Lab. de Mecanique des Structures.
DYNAMIC BEHAVIOR OF COMPOSITE LAYERED BEAMS BY THE FINITE ELEMENT METHOD c24
P. Trompette and R. Gaertner *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 151-157 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 11/4

A new finite element especially adapted to the study of unsymmetrical laminated straight or curved beams is presented and shear effects in all the laminates are included in the theory. Both the different stress and displacement continuity conditions at each laminate interface as the free stress conditions on the top and bottom surfaces of the beam are satisfied. This model was applied to the determination of resonance frequencies of a ski with different boundary conditions. Good agreement between experiences and calculations is observed. Some of the calculated frequencies are correlated to those measured during and actual ski run. E.A.K.

N84-19893# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION BULLETIN. PART 3: VEHICLE DYNAMICS AND VIBRATION: TEST AND CRITERIA Monthly Report
May 1983 177 p refs Proc. of the 53d Symp. on Shock and Vibration, Danvers, Mass., 26-28 Oct. 1982 4 Vol.
(AD-A134454; SVIC-Bull-53-Pt-3) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Vehicle and vehicle structure dynamics are discussed with particular attention given to vibration and vibration testing methodologies. Wheeled and tracked surface vehicles, aircraft, and spacecraft are addressed. For individual titles, see N84-19894 through N84-19907.

N84-19894# Patras Univ. (Greece). Dept. of Mechanical and Electrical Engineering.
RESEARCHING THE MAN-MACHINE SYSTEM AS A FUNCTION OF SOIL-ENVIRONMENT SYSTEM c54
A. Massinas and P. Drakatos (MIT) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 1-8 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 05/8

A stochastic model which describes the functional relationship between the man-machine system (MMS) and the soil environment system(SES) with respect to earth moving equipment is developed.

The Vashy-Buchingham theorem was applied and nondimensional P sub i terms resulted. This model was approved by means of a series of experiments that are valid for a large range of values.
Author

N84-19895# Patras Univ. (Greece). Dept. of Mechanical and Electrical Engineering.
A STOCHASTIC MODEL FOR THE MAN-MACHINE-SOIL-ENVIRONMENT SYSTEM (MMSES) AND THE INFLUENCE OF VIBRATIONS c54
A. Massinas and P. Drakatos (MIT) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 9-18 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 05/8

A stochastic model which describes the interaction of different parameters involved in the man-machine-soil-environment system (MMSES), with respect to the efficiency of the earth moving equipment is described. There is a large number of dependent and independent variables that effect the systems. However, only those which were thought to be influencial in the operation of the system were taken into consideration. The Vashy-Buckingham theorem was applied and nondimensional Pm terms were resulted. Employing the general form of curvilinear regression equation and the method of least squares through the use of a special computer program the functional relationships that govern the MMSE system were determined. Experiments using six operators, five types of soil and three different machines under different environmental conditions were carried out and various results obtained. The effects of vibrational acceleration were also taken into consideration. The validity of the model was justified by experimental results gathered from various sources during a five year period and also from the data obtained from various experiments made ad hoc. M.G.

N84-19896# Concordia Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
AN OPTIMUM SEAT-SUSPENSION FOR OFF-ROAD VEHICLES c54
S. Rakheja and S. Sankar *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 19-34 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 05/8

Low frequency terrain induced vibration transmitted to off-road vehicle operators are quite severe and exceed International Standards Organization (ISO) specified fatigue-decreased-proficiency limits. Design of an optimum seat-suspension to protect the drivers from incoming injurious vibrations in bounce, longitudinal, lateral, roll, and pitch modes, is presented. The existing bounce seat-suspension is modeled as a two-degree-of-freedom, non-linear system. Configuration of a horizontal isolator attachable to the existing bounce isolator to attenuate longitudinal and lateral vibration is proposed and modeled including nonlinearities. The nonlinear models in the three translational modes are linearized, and design parameters are selected through parametric optimization. Optimization problem is formulated to maintain the acceleration power spectral densities within the ISO specified limits, corresponding to 4 hours exposure while constraining the relative displacements to a minimum possible. Isolation of roll and pitch vibrations is sought through a gimbal arrangement mounted to the bounce isolator. Parametric optimization of the linear rotational model is carried out to maintain bounce acceleration response within 4 hours exposure limit (ISO), subject to constrained pitch and roll accelerations. M.G.

N84-19897# Martin Marietta Aerospace, Denver, Colo.
BRAKING-TURNING-MANEUVERING STABILITY OF HEAVY TRANSPORTERS c85
Phineas Woods *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 51-61 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 13/6

Stable equilibrium is examined for heavy transporters executing manuevers prescribed by several steering modes. Hydraulic suspension is modeled independently from the structural elements as a finite element fluid model. The fluid system is coupled to the structural system by Rayleigh-Ritz assumed modes which satisfy boundary conditions. Modes of the combines system are determined relative to fixed tire contact points and coupled to rigid body equations of the vehicle in a moving axis system. Equilibrium of forces and moments is defined for several maneuvers. Using equilibrium as a necessary condition for dynamic stability, the variational problem of small increments in velocities and accelerations is cast in the form of an eigenvalue problem to determine stable or unstable equilibrium. Application is made to two simplified models. A limited amount of full scale test data is compared with results. M.G.

N84-19898*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ACOUSTIC ENVIRONMENTS FOR JPL SHUTTLE PAYLOADS BASED ON EARLY FLIGHT DATA c16
Michael R. OConnell and Dennis L. Kern *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 63-77 refs (For primary document see N84-19893 10-39)
(Contract NAS7-100)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 22B

Shuttle payload acoustic environmental predictions for the Jet Propulsion Laboratory's Galileo and Wide Field/Planetary Camera projects have been developed from STS-2 and STS-3 flight data. This evaluation of actual STS flight data resulted in reduced predicted environments for the JPL shuttle payloads. Shuttle payload mean acoustic levels were enveloped. Uncertainty factors were added to the mean envelope to provide confidence in the predicted environment. Author

N84-19899# Concordia Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
COMPUTER AIDED SYNTHESIS OF A SATELLITE ANTENNA STRUCTURE WITH PROBABILISTIC CONSTRAINTS c32
V. K. Jha (SPAR Aerospace Ltd.), T. S. Sankar, and R. B. Bhat *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 79-89 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/13

The satellite antenna structures have to be designed to withstand the severe environmental conditions encountered by the satellite without failure, and hence they have to be designed with very strict reliability requirements. At the same time these structures should be as light as possible, in weight, to minimize the cost of launching the satellites into space. A computer aided design procedure capable of meeting these design requirements in presented. The procedure involves synthesis of a finite element analysis program capable of analyzing complex structures and a state of the art optimization algorithm into one unified design system. This system is used for designing antenna structures subjected to random excitations and having design requirements specified in a probabilistic manner. An approach is presented to handle probabilistic design requirements. The design of a typical satellite antenna structure realized using the proposed design procedure is presented. Starting from the best guessed design, a saving of 43% in weight is demonstrated. The proposed system is very versatile and the possibilities of extending it for designing other complex structures are also discussed. M.G.

N84-19900# Concordia Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
DYNAMIC BEHAVIOUR OF A SATELLITE ANTENNA STRUCTURE IN RANDOM VIBRATION ENVIRONMENT
V. K. Jha (SPAR Aerospace Ltd.), T. S. Sandar, and R. B. Bhat *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 91-103 refs (For primary document

see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Satellite antenna structures are often subjected to random excitations with power spectra densities varying in an arbitrary manner in the frequency domain. A mathematical model for effectively describing such excitations is proposed in order to compute the dynamic response of the antenna structure. The mathematical model of the excitation is developed analytically by enveloping the profile of the power spectral densities by linear segments of varying slopes. The validity of the proposed mathematical model is experimentally verified. The dynamic response of the satellite antenna structure is obtained using the proposed mathematical model for the excitation. The finite element program SPAR was used as the main frame for this dynamic response analysis. The eigenvalues and mode shapes along with displacements and stresses for the antenna structure subjected to random excitations encountered during normal operation are presented, employing the proposed mathematical model for the excitations. M.G.

N84-19901# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
INVESTIGATION OF THE ACOUSTIC CHARACTERISTICS OF AIRCRAFT/ENGINES OPERATING IN A DRY-COOLED JET ENGINE MAINTENANCE TEST FACILITY c07
V. R. Miller, G. A. Pizak, J. M. Chinn, and R. J. Reilly *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 105-114 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 21/5

A measurement program was undertaken to measure the acoustic environment in an Air Force hush house facility, during the operation of aircraft and uninstalled jet engines to ensure that structural sonic fatigue design limits were not exceeded. Data from external runway operations and other engine test facilities were also compared. The correspondence between noise levels at the hush house deflector ramp and the far-field was examined. The effect of axial levels inside the hangar was also investigated. M.G.

N84-19902# General Electric Co., Utica, N. Y. Aircraft Equipment Div.
CRITERIA FOR ACCELERATED RANDOM VIBRATION TESTS WITH NON-LINEAR DAMPING
Ronald G. Lambert *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 115-123 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Closed form analytical expressions were derived which related the parameters for accelerating Gaussian random vibration tests such that the fatigue damage accumulated is the same for both the accelerated and non-accelerated cases. The same failures, only sooner, is the objective. Nonlinear structural damping, the significant parameter considered, was chosen for its practical importance. Numerical examples are included. Author

N84-19903# Harris Corp., Melbourne, Fla.
VIBRATION TEST ENVIRONMENTS FOR ELECTRONICS MOUNTED IN A REMOTELY PILOTED VEHICLE c05
Vernon R. Beatty *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 125-134 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01/3

The development of vibration test environments for an airborne data terminal which is mounted in a remotely piloted vehicle is described. Results of finite element analysis and mechanical model testing showed that vibratory inputs to electronic components would exceed expected fragility levels. Expected in-service vibration levels were measured and used to redefine the vibration test requirements. Component vibratory inputs were then reduced below expected fragility levels. Costly overdesign was eliminated and the actual design is now based on the real-world vibration environment. M.G.

N84-19904# Harris Corp., Melbourne, Fla. Information Systems Div.
VIBRATION TEST SOFTWARE FOR ELECTRONICS MOUNTED IN A REMOTELY PILOTED VEHICLE c61
S. M. Landre *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 135-141 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 09/2

Vibration test software that was developed for testing electronics mounted in a remotely piloted vehicle (RPV) is described. The vibration test software simulated the actual vibration environment that the airborne data terminal (ADT) experienced when mounted in an RPV. This software was developed because there was no known software that could simulate the required vibration environment on a shaker. When the software was implemented it operated successfully and generated a simulated RPV vibration environment. M.G.

N84-19905# McDonnell-Douglas Corp., St. Louis, Mo.
TESTING FOR SEVERE AERODYNAMICALLY INDUCED VIBRATION ENVIRONMENTS c02
H. N. Roos and G. R. Waymon *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 155-159 ref (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01/1

Low speed wind tunnel and flight testing were conducted to evaluate F-15 vertical tail vibration response to excitation from separated airflow at high angles of attack. Good correlation was obtained between wind tunnel and flight vibration data. Flow visualization tests done in the wind tunnel determined that the separated flow effecting the tails comes from the mid-span leading edge of the wing. A special high-amplitude laboratory vibration exciter system was developed to duplicate the tail vibration level and to qualify all tail mounted equipment. M.G.

N84-19906# National Space Development Agency, Tokyo (Japan).
EVALUATION OF MODAL TESTING TECHNIQUES FOR SPACECRAFT STRUCTURES c08
Kuniaki Shiraki and Hidehiko Mitsuma *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 161-170 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 22B

A comparative study of modal testing techniques with a base classical sine sweep and random test methods based upon digital analysis techniques are compared by measuring transfer functions of a simple beam specimen. For the random test data, modal analyses were performed using two kinds of analyzers, for two steps of input levels, respectively. The modal parameters obtained by both analyzers were in good agreement. And the structural response nonlinear characteristics due to the input level change were investigated. An example of the application of these techniques to the development of the Engineering Test Satellite 3 is shown. M.G.

N84-19907# Martin Marietta Aerospace, Denver, Colo.
A FREE-FORM MODAL SURVEY SUSPENSION SYSTEM FOR LARGE TEST ARTICLES
Rick Webb *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 171-179 (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The first assembly of a full size, flight weight MX missile was accomplished for the purpose of conducting a modal survey test on a flight configured test article. In order to approximate a free-free boundary condition simulating a missile in flight, a

suspension system was required that would provide adequate separation ratios between lateral suspension frequencies and test article bending modes. A suspension system was developed that employed a large annular base ring, to which the aft end of the first stage mounted, suspended vertically by three 200 inch long pendulum rods. The three point suspension provided lateral stability even with a test article CG that was appreciably higher than the upper support point of the pendulum rods, while rod length was sufficient to allow rotational freedom of the missile base. A summary of the design and performance parameters is presented. M.G.

N84-19908# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION BULLETIN. PART 4: DAMPING AND MACHINERY DYNAMICS Monthly Report
May 1983 154 p refs Proc. of the 53d Symp. on Shock and Vibration, Danvers, Mass., 26-28 Oct. 1982 4 Vol.
(AD-A134455; SVIC-Bull-53-Pt-4) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Various topics relative to shock and vibration are discussed. Vibration tests, vibration damping, rotating disks, rotating shafts, vibration isolators, fluid films, hysteresis, harmonic excitation, and gas turbines are among the topics discussed. For individual titles, see N84-19909 through N84-19923.

N84-19909# Concordia Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
EXPERIMENTAL INVESTIGATION OF CONTROLLING VIBRATIONS USING MULTI-UNIT IMPACT DAMPERS
C. N. Bapat, S. Sankar, and N. Popplewell (Manitoba Univ.) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 1-12 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Free and forced vibrations of multi-unit impact damper were investigated experimentally. In free vibrations, the time rate of decrease of maximum displacement increased with number of units and was nearly constant, only when initial deflection was greater than gap. In steady state motion, with identical gaps, under sinusoidal load, impacts generally occurred only over a fraction of a cycle. Performance, defined as a ratio of displacement amplitude with damper to displacement amplitude without damper, improved with number of units only when excitation frequency was equal to or greater than resonant frequency of damperless system. Maximum amplitude reduction occurred at resonance and otherwise, it decreased at a faster rate below resonance than above it. Hence, similar to a single-unit, even multi-unit impact damper should be used with caution when excitation frequency is below resonant frequency, as displacement amplification can occur in this range. Author

N84-19910# Manitoba Univ., Winnipeg. Dept. of Civil Engineering.
AN EXPERIMENTAL HYBRID MODEL FOR A BILINEAR HYSTERETIC SYSTEM
K. R. McLachlan, N. Popplewell, W. J. McAllister, and C. S. Chang (Inst. of Mechanics) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 13-17 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

An experimental model was developed to simulate the non-linear behavior of a complex hysteretic system. Experimental data from the simplest form of this electro-mechanical model, the single degree-of-freedom system, is helpful in reconciling previously disparate theoretical results. It is believed that more general forms of such models will provide valuable physical insight into realistic situations. R.J.F.

N84-19911# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
MEASUREMENT AND ANALYSIS OF PLATFORM DAMPING IN ADVANCED TURBINE BLADE RESPONSE
Thomas J. Lagnese and D. I. G. Jones *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 19-28 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The measurement of dry friction damping is experimentally investigated by means of a digital signal data processing technique. The experimental technique identifies narrow frequency bandwidth linearity of the non-linear response data and is compared with analytical results for a two-degree of freedom model of the blade. R.J.F.

N84-19912# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Materials Lab.
A VIBRATION DAMPING TREATMENT FOR HIGH TEMPERATURE GAS TURBINE APPLICATIONS
Ahid D. Nashif (Anatrol Corp.), William D. Brentnall (Solar Turbines, Inc.), and David I. G. Jones *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 29-40 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

An investigation of the behavior and properties of a family of vitreous enamels designed to give high damping properties when applied as coatings to high temperature static components in gas turbine engines is discussed. Complex modulus properties and effects of thermal aging are discussed. R.J.F.

N84-19913# Nebraska Univ., Lincoln. Dept. of Engineering Mechanics.
EXPERIMENTAL MEASUREMENT OF MATERIAL DAMPING USING DIGITAL TEST EQUIPMENT
P. W. Whaley and P. S. Chen *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 41-50 (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A procedure for measuring loss factor under random vibration using two digital spectrum analyzers is described. For sinusoidal testing, errors of several orders of magnitude can result from slightly missing the specimen resonant frequency. This means that the processing bandwidth in digital spectrum analysis procedures must be very small, typically requiring a high resolution fast Fourier transformation. A weighting function is introduced to eliminate this bandwidth constraint by calculating the exact transfer function from the measured root mean square transfer function. This provides a rapid, accurate procedure for calculating loss factor. Author

N84-19914# Air Force Weapons Lab., Kirtland AFB, N. Mex.
ELECTRONIC DAMPING OF A LARGE OPTICAL BENCH
Robert L. Forward (Hughes Research Labs.), Charles J. Swigert (Hughes Aircraft Co.), and Michael Obal *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 51-61 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Electronic damping was used to reduce the amplitude of response of two problem vibrational resonances in a large optical bench. A small (76.2 x 15.88 x 1.52 mm) 14-g piezoelectric ceramic strain transducer was used as a sensor, and ten others in parallel were used as a combined driver in a velocity-feedback damping loop operating on the bench. The data shows that electronic damping using a single damping loop is sufficient to control both models even when excited at the high levels of acoustic and vibrational noise experienced by the bench in its operational environment. R.J.F.

N84-19915# Maryland Univ., College Park.
MEASUREMENT OF STRUCTURAL DAMPING USING THE RANDOM DECREMENT TECHNIQUE
J. C. S. Yang, N. G. Dagalakis, G. C. Everstine (Naval Ship R&D Center), and Y. F. Wang (Naval Ship R&D Center) *In* Shock and

Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 63-71 refs (For primary document see N84-19908 10-39)
(Grants N00014-78-C-0675; N61533-80-M-1520)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The use of the Random Decrement analysis technique was investigated for the determination of natural frequencies ad damping ratios of different structural systems. The technique was applied to actual experimental response data recorded from transducers placed on off-shore platforms, bridges, and human bones. To validate the technique, an analytical study was conducted with some simple systems as well as with a finite element model of a complex structural system. The excitation signal used was a random white noise signal. Damping values were preset for all the cases considered. The results of the analysis for the cases in which the structural modes were well separated showed excellent agreement. When the modal density was high, a curve fitting program was used. The results from the analysis of the response of a finite element model of the complex structural system subjected to a random input excitation showed reasonable agreement. The technique can be used to determine damping of a complex structural system, and technique is relatively independent of the input excitation. The technique can be used for detection of cracks in structures. R.J.F.

N84-19916# Vermont Univ., Burlington. Dept. of Mechanical Engineering.
DAMPED PNEUMATIC SPRING AS SHOCK ISOLATOR: GENERALIZED ANALYSIS AND DESIGN PROCEDURE c39
M. S. Hundal *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 73-83 refs (For primary document see N84-19908 10-83)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Modeling, response and design procedure for a pneumatic shock isolator are presented. The isolator is a single-acting pneumatic spring with self-damping. The undamped pneumatic spring is also analyzed, the results for which can be more readily used as the starting point in the design process. Parametric studies show the effect of nondimensional parameters on system response. It is shown that a pneumatic spring and a linear spring isolator experience the same displacement for a short duration pulse. Author

N84-19917# Indian Inst. of Tech., New Delhi.
ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF ROTATING BLADE RESPONSE DUE TO NOZZLE PASSING FREQUENCY EXCITATION
J. S. Rao, H. M. Jadvani (Regional Engineering College), and P. V. Reddy (Escorts Scientific Research Centre) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 85-101 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The differential equations of motion of forced vibrations of a pre-twisted, staggered and rotating blade of uniform cross-section are derived using Lagrange's equations. The excitation of the blade is taken in the form of nozzle passing frequency (NPF) excitation. The effect of proportional damping is taken into consideration and the effects of rotary inertia and shear deformation are neglected. The forced vibration response is determined by using modal analysis. A test rig designed to study forced vibration response under NPF is described. In this rig, the NPF excitation is simulated by permanent magnets located at required distances from the blades. The analytical and experimental response at the nozzle passing frequencies is compared and a good agreement was shown. R.J.F.

N84-19918# Institut National des Sciences Appliquees de Lyon, Villeurbanne (France). Lab. de Mecanique des Structures.
PREDICTION OF CRITICAL SPEEDS, UNBALANCE AND NONSYNCHRONOUS FORCED RESPONSE OF ROTORS
P. Berthier, G. Ferraris, and M. Lalanne *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 103-111 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The dynamic behavior of rotors must be accurately predicted today at the design stage of construction of rotating machinery. Here the general equations of rotors consisting of symmetric shafts, rigid discs and nonsymmetric bearings are presented. These equations are obtained by using a finite element technique and solved with a modal method. Two industrial applications, a gas turbine and a centrifugal compressor, are presented for which the critical speeds, unbalance and nonsynchronous forced response are calculated. Author

N84-19919# Concordia Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
UNBALANCE RESPONSE OF A SINGLE MASS ROTOR MOUNTED ON DISSIMILAR HYDRODYNAMIC BEARINGS c37
R. Subbiah, R. B. Bhat, and T. S. Sankar *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 113-125 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 13/8

The critical speeds and unbalance response of a single mass rotor, mounted on dissimilar fluid-film bearings at the ends, are studied. The direct and cross-coupled coefficients of stiffness and damping at the bearings are included in the analysis, which are expressed as polynomials in Sommerfeld number. The equations of motion are obtained by Lagrangian approach. The resulting equations of motion are solved to obtain the unbalance response and critical speeds. Numerical results are obtained for a laboratory model of a single mass rotor and the effects of various parameters of the system on the response are investigated. The response of the rotor at the bearing locations are also obtained. Author

N84-19920# Engineering-Analytical Dynamics Corp., Trafford, Pa.
NONLINEAR COUPLING RESPONSES TO VARIABLE FREQUENCY EXCITATIONS
A. J. Molnar and F. H. Wolff *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 127-137 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Effects of a nonlinear coupling with a hardening torque-deflection characteristic on shaft torsional vibrations from a variable frequency excitation are calculated. Amplitudes for an accelerating excitation frequency are greater than amplitudes predicted by linear theory; whereas, amplitudes for a decelerating excitation frequency are less than amplitudes predicted by linear theory. With a nonlinear coupling both harmonic and subharmonic vibrations can occur when more than one vibration mode is involved. Author

N84-19921# Engineering-Analytical Dynamics Corp., Trafford, Pa.
SIMPLE APPROXIMATE MODELS FOR A CLASS OF STRUCTURES
A. J. Molnar and F. H. Wolff *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 137-146 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A two mass approximate model for investigating the interaction for a class of structures in a particular frequency range is developed. The method is applicable to both analytical finite element type models as well as physical structures where vibration response data are available. Author

N84-19922# Massachusetts Inst. of Tech., Cambridge.
SOURCE SIGNATURE RECOVERY IN REVERBERANT STRUCTURES
Richard H. Lyon *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 141-144 refs (For

primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The use of vibration or acoustical signals to reveal operational parameters or developing faults of a machine is very attractive. If one wishes to monitor a number of sources of vibration in a machine, then either a multiplicity of sensors must be used or individual sensors must each monitor several sources. If information is to be determined from sensors that are not close to sources, then the effects of the propagation on the vibration signal may become troublesome. The conversion of remotely sensed vibration or sound to a source signal generally involves some form of inverse filter transfer function which has a magnitude and phase; evidence shows that the phase is more important. Research concentrated on the phase, its estimation and its measurement in complex structures. The phase of measured transfer functions, even in very reverberant systems, has a strong tendency to have a lag that increases with increasing frequency. The reason for this phase trend, and its significance in defining the appropriate inverse filter were discussed. R.J.F.

N84-19923# Westinghouse Electric Corp., Sunnyvale, Calif. Marine Div.
COMPARISON OF STATISTICAL ENERGY ANALYSIS AND FINITE ELEMENT ANALYSIS VIBRATION PREDICTION WITH EXPERIMENTAL RESULTS
L. K. H. Lu, W. J. Hawkins, D. F. Downard, and R. G. DeJong (Cambridge Collaborative) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 4 May 1983 p 145-154 refs (For primary document see N84-19908 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

In order to further understand the practical application of the Statistical Energy Analysis, a two section plate-like frame structure is analyzed by the finite element method, statistical energy analysis, and experimental techniques. Results are compared, discussed and also used as a benchmark for a newly developed in-house SEA Computer Program. Author

N84-19924*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
AN ASSESSMENT OF THE ACCURACY OF ORTHOTROPIC PHOTOELASTICITY Final Report, Nov. 1981 - Sep. 1982
M. W. Hyer and D. H. Liu Washington NASA Mar. 1984 256 p refs
(Grant NsG-1621)
(NASA-CR-3773; NAS 1.26:3773) Avail: NTIS HC A12/MF A01 CSCL 20K

The accuracy of orthotropic photoelasticity was studied. The study consisted of both theoretical and experimental phases. In the theoretical phase a stress-optic law was developed. The stress-optic law included the effects of residual birefringence in the relation between applied stress and the material's optical response. The experimental phase had several portions. First, it was shown that four-point bending tests and the concept of an optical neutral axis could be conveniently used to calibrate the stress-optic behavior of the material. Second, the actual optical response of an orthotropic disk in diametral compression was compared with theoretical predictions. Third, the stresses in the disk were determined from the observed optical response, the stress-optic law, and a finite-difference form of the plane stress equilibrium equations. It was concluded that orthotropic photoelasticity is not as accurate as isotropic photoelasticity. This is believed to be due to the lack of good fringe resolution and the low sensitivity of most orthotropic photoelastic materials. Author

N84-19925*# Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
CREEP-RUPTURE RELIABILITY ANALYSIS Final Report
Alonso Peralta-Duran and Paul H. Wirsching Washington NASA Mar. 1984 31 p refs
(Grant NAG3-41)
(NASA-CR-3790; E-1982; NAS 1.26:3790) Avail: NTIS HC A03/MF A01 CSCL 20K

A probabilistic approach to the correlation and extrapolation of creep-rupture data is presented. Time temperature parameters (TTP) are used to correlate the data, and an analytical expression for the master curve is developed. The expression provides a simple model for the statistical distribution of strength and fits neatly into a probabilistic design format. The analysis focuses on the Larson-Miller and on the Manson-Haferd parameters, but it can be applied to any of the TTP's. A method is developed for evaluating material dependent constants for TTP's. It is shown that optimized constants can provide a significant improvement in the correlation of the data, thereby reducing modelling error. Attempts were made to quantify the performance of the proposed method in predicting long term behavior. Uncertainty in predicting long term behavior from short term tests was derived for several sets of data. Examples are presented which illustrate the theory and demonstrate the application of state of the art reliability methods to the design of components under creep. Author

N84-19926*# Lehigh Univ., Bethlehem, Pa.
SURFACE CRACKS IN A PLATE OF FINITE WIDTH UNDER TENSION OR BENDING
F. Erdogan and H. Boduroglu (Technical Univ. of Istanbul) Hampton, Va. NASA. Langley Research Center Feb. 1984 41 p refs
(Grants NGR-39-007-011; NSF MEA-82-09083)
(NASA-CR-172309; NAS 1.26:172309) Avail: NTIS HC A03/MF A01 CSCL 20K

The problem of a finite plate containing collinear surface cracks is considered and solved by using the line spring model with plane elasticity and Reissner's plate theory. The main focus is on the effect of interaction between two cracks or between cracks and stress-free plate boundaries on the stress intensity factors in an effort to provide extensive numerical results which may be useful in applications. Some sample results are obtained and are compared with the existing finite element results. Then the problem is solved for a single (internal) crack, two collinear cracks, and two corner cracks for wide range of relative dimensions. Particularly in corner cracks, the agreement with the finite element solution is surprisingly very good. The results are obtained for semi-elliptic and rectangular crack profiles which may, in practice, correspond to two limiting cases of the actual profile of a subcritically growing surface crack. Author

N84-19927*# Akron Univ., Ohio. Dept. of Mechanical Engineering.
EXPERIMENTAL STUDY OF UNCENTRALIZED SQUEEZE FILM DAMPERS
Roger D. Quinn Dec. 1983 127 p refs
(Grants NsG-3283; NAG3-50)
(NASA-CR-168317; NAS 1.26:168317; NAUFP-202-2) Avail: NTIS HC A07/MF A01 CSCL 20K

The vibration response of a rotor system supported by a squeeze film damper (SFD) was experimentally investigated in order to provide experimental data in support of the Rotor/Stator Interactive Finite Element theoretical development. Part of the investigation required the designing and building of a rotor/SFD system that could operate with or without end seals in order to accommodate different SFD lengths. SFD variables investigated included clearance, eccentricity mass, fluid pressure, and viscosity and temperature. The results show inlet pressure, viscosity and clearance have significant influence on the damper performance and accompanying rotor response. Author

N84-19928*# Lehigh Univ., Bethlehem, Pa.
THE CRACK-INCLUSION INTERACTION PROBLEM
LiuK Xue-Hui and F. Erdogan Hampton, Va. NASA. Langley Research Center Feb. 1984 71 p refs
(Grant NGR-39-007-011; Contract DTRS56-82-C-00014)
(NASA-CR-172308; NAS 1.26:172308) Avail: NTIS HC A04/MF A01 CSCL 20K

The general plane elastostatic problem of interaction between a crack and an inclusion is considered. The Green's functions for

a pair of dislocations and a pair of concentrated body forces are used to generate the crack and the inclusion. Integral equations are obtained for a line crack and an elastic line inclusion having an arbitrary relative orientation and size. The nature of stress singularity around the end points of rigid and elastic inclusions is described and three special cases of this intersection problem are studied. The problem is solved for an arbitrary uniform stress state away from the crack-inclusion region. The nonintersecting crack-inclusion problem is considered for various relative size, orientation, and stiffness parameters, and the stress intensity factors at the ends of the inclusion and the crack are calculated. For the crack-inclusion intersection case, special stress intensity factors are defined and are calculated for various values of the parameters defining the relative size and orientation of the crack and the inclusion and the stiffness of the inclusion. A.R.H.

N84-19929# Air Force Engineering and Services Center, Tyndall AFB, Fla.

EVALUATION OF NASA STRUCTURAL ANALYSIS (NASTRAN) TO PREDICT THE DYNAMIC RESPONSE OF REINFORCED CONCRETE Final Report, 27 May - 5 Aug. 1981

W. W. Payne, Jr. Dec. 1983 54 p
(Contract F49620-79-C-0038; AF Proj. 2673)
(AD-A137244; AFESC/ESL-TR-82-50) Avail: NTIS HC A04/MF A01 CSCL 13/13

This report evaluates the ability of the finite element program, NASTRAN, to analyze reinforced concrete structures under dynamic loads. Experimental data from a quarter scale model test of an underground shelter was used to validate the computer projections. NASTRAN is a general-purpose structural analysis program containing several types of finite element and several displacement analysis approaches. For this study five different computer models for reinforced concrete were used. The models were composed of the following elements: (1) Plate membrane elements, (2) Plate membrane and rod elements, (3) Plate-bending elements, (4) Plate-bending-membrane elements, (5) Plate-bending-membrane and beam elements, Static Analysis and Transient Analysis approaches were used to evaluate the computer model. Favorable results were obtained for the plate membrane and rod element model using the Transient Analysis Approach. Strain in the reinforcing rods, time to maximum strain, and time to return to zero strain were used to compare the experimental data to the computer prediction. GRA

N84-19930# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.

THE PROPAGATION AND ARREST OF AN EDGE CRACK IN AN ELASTIC HALF-SPACE UNDER CONDITIONS OF ANTI-PLANE SHEAR: ANALYTICAL AND NUMERICAL RESULTS

Timothy C. OSullivan Sep. 1983 70 p
(Contract N00014-75-C-0196)
(AD-A137275; TR-53) Avail: NTIS HC A04/MF A01 CSCL 12/1

The motion of an edge crack extending non-uniformly in an elastic half-space under conditions of anti-plane shear is analyzed. An expression for the stress intensity factor at the crack tip is obtained, and an energy balance crack propagation criterion is used to find the equation of motion of the tip. On solving this equation numerically, it is found that crack arrest occurs before the second reflected wave from the boundary reaches the tip. In the second half of this investigation, a numerical procedure for studying anti-plane shear crack propagation problems using finite differences is developed. To approximate the elastodynamic field as accurately as possible near the moving crack tip, where singular stresses occur, the local asymptotic displacement field near the tip is incorporated into the finite difference scheme. The numerical procedure is applied to the edge crack problem analyzed in the first part of this study, and the numerical and exact results are compared. Author (GRA)

N84-19931# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

NUMERICAL DETERMINATION OF THE EFFECTS OF BOUNDARY CONDITIONS ON THE INSTABILITY OF COMPOSITE PANELS WITH CUTOUTS M.S. Thesis

C. E. Lee Dec. 1983 141 p
(AD-A136772; AFIT/GA/AA/83D-4) Avail: NTIS HC A07/MF A01 CSCL 20/11

An analytical study using the STAGSC-1 computer code was conducted to determine the effects of notches and unsymmetric boundary conditions on the load bearing capability and radial displacements of axially loaded cylindrical panels. The graphite-epoxy panel consisted of an 8 ply laminate with symmetric ply orientations. A finite element mesh refinement in the vicinity of the cutout was conducted in order to study the non-linear collapse analysis. In addition, the effect of different size cutouts with aspect ratios (axial dimension of cutout divided by circumferential dimension) of 2.0 or 0.5 was studied. Finally, analytic results for a 2 in. x 2 in. cutout with a varying set of boundary conditions were compared to experimental findings. It was found that as the surface area of the cutout increased, the buckling load decreased. Cutouts with aspect ratios of 2.0 were found to be capable of carrying higher loads than notches with an aspect ratio of 0.5. By comparing analytic results with experimental data, it was found that unsymmetric boundary conditions for the 2 in. x 2 in. cutout better approximated experimental data than when symmetric boundary conditions were considered. GRA

N84-19932# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

A VARIATIONAL METHOD FOR CALCULATING THE NATURAL FREQUENCIES AND MODE SHAPES OF A CANTILEVERED OPEN CYLINDRICAL SHELL M.S. Thesis

J. V. Kouri Dec. 1983 93 p
(AD-A136901; AFIT/GAE/AA/83D-11) Avail: NTIS HC A05/MF A01 CSCL 20/11

This report develops a variational technique for the analysis of the vibration characteristics of an open cylindrical cantilevered shell. The technique is developed by modifying Reissner's principle, which normally applies to static problems, through the use of Hamilton's principle so that it applies to dynamic problems. The variational technique is first derived in general for an elastic system, and then specifically tailored to an open cylindrical cantilevered shell. The technique is implemented by first finding a general solution which satisfies the equations of motion for a cylindrical shell. A method is then formulated to use this general solution to construct a set of trial solution functions. With the variational method, the coefficients to this trial solution function are then calculated so that the function not only satisfies the equations of motion, but also the boundary conditions around the four edges of the shell. A computer method was developed to perform the necessary calculations to implement the variational procedure, but preliminary results have shown that numerical problems must be eliminated before accurate results can be expected. Experimental data for an open cylindrical cantilevered shell was also collected on a modal analyzer. GRA

N84-19933# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

TRANSITION OF CORNER CRACKS AT HOLES INTO THROUGH-THE-THICKNESS CRACKS M.S. Thesis

S. W. Opel Dec. 1983 103 p
(AD-A136922; AFIT/GAE/AA/83D-17) Avail: NTIS HC A06/MF A01 CSCL 20/11

This study developed correction factors for currently used stress intensity factor equations to more accurately predict stress intensity factors for a corner crack emanating from a hole as it transitions to a uniform through-the-thickness crack. These correction factors resulted in an approximate 15 percent increase in total life prediction and a far better correlation between analytical stress intensity factor predictions and experimental results in the transition region. The material used for total life predictions was 7075-T651 Aluminum, and the initial crack eccentricity, a/c, was always greater than one. GRA

N84-19934# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
ANALYZING SLIDING STABILITY OF STRUCTURES USING THE MODIFIED COMPUTER PROGRAM GWALL, REVISION
R. L. Hall Nov. 1983 31 p
(AD-A136954; AD-E001638; WES-INSTRUCTION-K-83-7) Avail: NTIS HC A03/MF A01 CSCL 13/13

This instruction manual provides updated directions for using the computer program GWALL which has been modified through usage; GWALL is an interactive graphics program for analyzing the sliding stability of structures. The program provides for display of input data for easy checking and editing and requires the use a Tektronix 4014 or other terminal with the same capabilities. The analysis is a wedge method slope stability analysis that follows the design procedures used in the Lower Mississippi Valley Division for analysis of plane failures. The program provides for calculation of uplift by entering a profile of force water seepage pressures. GRA

N84-19935# Texas Univ., Austin. Dept. of Civil Engineering.
ANALYSIS OF A HIGH-STRENGTH CONCRETE MODEL UNDER BIAXIAL COMPRESSION Final Research Report
P. M. Castro, J. L. Tassoulas, R. L. Carrasquillo, and D. W. Fowler May 1983 146 p
(Grant AF-AFOSR-0202-81; AF Proj. 2307)
(AD-A137050; AFOSR-83-1341TR) Avail: NTIS HC A07/MF A01 CSCL 13/3

The behavior of a model of high-strength concrete consisting of nine coarse aggregate circular inclusions in a square mortar matrix is studied under biaxial compressive loads. Constitutive equations are developed following the theory of plasticity in order to describe the behavior of mortar in biaxial compression. The bond between mortar and aggregates is simulated by an interface element. A comparison of analytical and experimental results shows good agreement. Author (GRA)

N84-19936# Oak Ridge National Lab., Tenn.
EVALUATIONS OF THE IRWIN (ALPHA) SUB Ic ADJUSTMENT FOR SMALL SPECIMEN FRACTURE TOUGHNESS DATA
J. G. Merkle 1983 19 p refs Presented at 11th NRC Water Reactor Safety Res. Inform. Meeting, Gaithersburg, Md., 14 Oct. 1983
(Contract W-7405-eng-26)
(DE84-003292; CONF-8310143-57) Avail: NTIS HC A02/MF A01

Specimen thickness size effects and large amounts of data scatter are often observed when small specimens are used to measure the cleavage fracture toughness of pressure vessel steels in the transition range of temperature. The size effects are manifested by an increase in the average value of fracture toughness with decreasing specimen thickness, which results in a change in fracture mode from cleavage to ductile tearing. It is shown that a semiempirical adjustment for the interacting effects of specimen thickness, yield stress and toughness is capable of reducing the calculated values of toughness and data scatter to levels, consistent with large specimen test data and is true for dynamic and static initiation toughness values. The nature of the size effect described (ALPHA)/sub Ic/ equation is illustrated and specific cases are shown in which (ALPHA)/sub Ic/ adjustment has eliminated size effects, for both static and dynamic fracture toughness data. DOE

N84-19937# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
COMPARISON OF FATIGUE LIFE PREDICTION BASED ON LOCAL STRAINS AND NOMINAL STRESSES RESPECTIVELY
O. Buxbaum, H. Oppermann, H.-G. Koebler, D. Schuetz (Technische Hochschule, Darmstadt, West Germany), Ch. Boller (Technische Hochschule, Darmstadt, West Germany), P. Heuler (Technische Hochschule, Darmstadt, West Germany), and T. Seeger 1983 181 p refs In GERMAN; ENGLISH summary Sponsored by Deutschen Forschungsgemeinschaft
(LBF-FB-169(183); ISSN-0721-5320) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 140

Fatigue life predictions for steel based on local strains and on nominal stresses are compared for notched cylindrical bending test specimens of 42CrMo4, Ck45, and 49MnVS3 under random loading. Results show that the accuracy of life prediction based on local strains increases with the endurance limit and the S-N curve of the notched specimen. The accuracy of life prediction based on nominal stresses depends on the slope of the S-N curve assumed to be valid below the endurance limit. The comparison of the two methods reveals no advantage for either. Author (ESA)

N84-19938# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
A TESTING MACHINE FOR STATISTICAL ANALYSIS OF SMALL IMPERFECT SHELLS, PART 1
W. D. Verduyn and I. Elishakoff (Israel Institute of Technology, Haifa, Israel) Sep. 1982 36 p refs Presented at 7th Intern. Conf. on Exptl. Stress Anal., Haifa, Israel, 23-27 Aug. 1982 Sponsored by Technion-Israel Inst. of Technology
(VTH-LR-357-Pt-1) Avail: NTIS HC A03/MF A01

A compression test machine for stochastic representation of the imperfections associated with a given shell production process was built. The machine uses seamless beer cans as test specimens. Installation of the cans, test set up, measuring pickup, loading mechanism and load cell, and the measuring system and procedure are described. Rigid body motion and discrete compressive load tests were performed. Initial imperfections appear as waves in the circumferential direction. Author (ESA)

N84-19939# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
INTERPOLATION BETWEEN CALCULATED STRESS INTENSITY FACTORS OF SEMI AND QUARTER ELLIPTICAL CRACKS
J. Schijve Jan. 1983 30 p refs
(VTH-LR-368) Avail: NTIS HC A03/MF A01

Accuracy of interpolation of calculated stress intensity factors for semi-elliptical surface cracks and for quarter elliptical corner cracks at open holes and pin loaded holes was studied. Depth to thickness ratio (a/t) aspect ratio of ellipse (a/c) and hole radius to thickness ratio were interpolated. For surface cracks the best interpolation results are obtained with F3 values. For corner cracks F2 values are better. The first interpolation step should be made between results for different a/c-values but the same a/t, to get the required c/t (crack length), instead of interpolating to the required a/c (crack shape). In the first interpolation step a linear interpolation with a/c as a variable gives the best results. In the second step a linear interpolation with a/t as a variable gives the best results for surface cracks, for corner cracks square root of a/t is better. Accuracy is within 2%. Author (ESA)

N84-19940# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
COMPARISON BETWEEN EMPIRICAL AND CALCULATED STRESS INTENSITY FACTORS OF HOLE EDGE CRACKS
J. Schijve Feb. 1983 15 p refs
(VTH-LR-376) Avail: NTIS HC A02/MF A01

Digitized data on growth of corner cracks at holes in a plate loaded in tension were obtained. Empirical stress intensity factors derived from these data were compared to stress intensity factors obtained by interpolation of calculated data. Satisfactory agreement is found. Author (ESA)

N84-19941# Sydney Univ. (Australia). School of Civil and Mining Engineering.
BUCKLING OF STIFFENED CYLINDRICAL BINS UNDER WIND LOADING
M. J. Blackler and P. Ansourian Jun. 1983 28 p refs
(PB84-137926; R-446) Avail: NTIS HC A03/MF A01 CSCL 20K

A computer program was developed to analyze shell structures by the superposition of a refined plate bending finite element and

a plane stress element, and by a transformation to three dimensional space. The program is now capable of analyzing linear and stability problems of elastic shells and has been shown to give accurate results when compared with available classical solutions.
GRA

42 GEOSCIENCES (GENERAL)

N84-19942 Bayerische Akademie der Wissenschaften, Munich (West Germany).
NATIONAL REPORT OF THE FEDERAL REPUBLIC OF GERMANY ON GEODETIC ACTIVITIES, 1979 - 1983
1983 251 p refs In ENGLISH and GERMAN Proc. of 18th intern Union for Geodesy and Geophys. Gen. Assembly, Hamburg, 15-27 Aug. 1983 Original contains color illustrations
(Ser-B-265; ISBN-3-7696-8558-X; ISSN-0065-5317) Copyright.
Avail: Issuing Activity

Horizontal geodetic control networks, leveling, geodetic astronomy, observation of satellites and VLBI, gravimetry, physical geodesy, mathematical modeling, Earth tides, and crustal movements are considered. For individual titles, see N84-19943 through N84-19952.

N84-19943 Bayerische Akademie der Wissenschaften, Munich (West Germany).
HORIZONTAL GEODESY CONTROL NETWORKS c43
R. Kelm and H.-J. Kriefall *In its* Natl. Rept. of The Federal Republic of Germany on Geodetic Activitie, 1979 - 1983 1983 p 8-48 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

The German Horizontal Geodesy Network; surveying and investigations in scientific nets; and geodetic network theory are discussed. In the German Network, 1st and 2nd order distance measurements were performed to improve quality. The European Horizontal Network (RETrig); geodynamical investigations networks; and geodetic research nets are represented. Net design; survey procedures; net adjustment; variance-covariance estimation; net transformation; representation of net quality (outliers, systematic errors, reliability); deformation analysis of nets measured at different epochs; three dimensional net computations up to integrated net adjustment; and computer programs for nets are treated.
Author (ESA)

N84-19944 Bayerische Akademie der Wissenschaften, Munich (West Germany).
PRECISE LEVELING c43
Rodulf Stuerzer *In its* Natl. Rept. of the Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 49-64 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

A complete resurvey of the German Precise Leveling Network (DHHN) is described. Each line of the Unified European Leveling Network was renewed. The resurvey reveals that some automatic levels are dependent on magnetic fields. The scale factor of leveling rods and vertical refraction was studied. For better interpretation of height alterations and as a designing means for vertical control nets, a map showing geological stability areas was published.
Author (ESA)

N84-19945 Bayerische Akademie der Wissenschaften, Munich (West Germany).
GEODETIC ASTRONOMY c43
Gerhard Soltau *In its* Natl. Rept. of the Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 65-76 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

Procedures and instruments used in geodetic astronomy to determine positions, time, and azimuths are described. Geoid and latitude and longitude determinations are discussed. Astrolabe data reduction by group evaluation and by a global solution of all stellar transits is outlined. Differences between results of individual observers using astrolabes are noted. Corrections for the proper motions and positions of 119 stars are reported. A FORTRAN program for deriving apparent stellar position from mean position was developed.
Author (ESA)

N84-19946# Bayerische Akademie der Wissenschaften, Munich (West Germany).
THE OBSERVATION OF ARTIFICIAL SATELLITES AND VLBI c15
E. Reinhart, H. Seeger, and P. Wilson *In its* Natl. Rept. of the Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 78-109 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

Satellite and lunar laser ranging, very long base interferometry (VLBI), and Doppler and directional measurements of satellites are described. A stationary Nd : YAG ranging system was operated. A modular transportable laser ranging system was developed. Time services based on cesium, rubidium, and Besson quartz frequency standards and a hydrogen maser are discussed. Applications of VLBI to geodesy, geophysics and astrometry are summarized. The TIMEDOC, BONDOC, WESTHARZ, ERIDOC, NIEDOC, ALGEDOP, BLNDOC and CIDOC, Doppler campaigns are outlined. Marine geodesy and ice monitoring are mentioned.
Author (ESA)

N84-19947# Bayerische Akademie der Wissenschaften, Munich (West Germany).
THE GEODETIC USE OF SATELLITE OBSERVATIONS c43
Christoph Reigber *In its* Natl. Rept. of the Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 110-126 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

Improvements in satellite orbit determination capacity; applications of altimetry, satellite-to-satellite tracking and gradiometer data; investigations into representations of the Earth's gravity field; and use of satellite observations for precise point positioning are discussed. Satellite observations were analyzed and results obtained for regional altimeter geoids. Coordinates of the rotation pole and variations in the rate of rotation of the Earth; geocentric coordinates of tracking stations, and continental and intercontinental base-lines; and global gravity field models and shape of the Earth are considered.
Author (ESA)

N84-19948 Bayerische Akademie der Wissenschaften, Munich (West Germany).
GRAVIMETRY c46
Wolfgang Torge *In its* Natl. Rept. of Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 128-139 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

Measurements in the world gravity net, West German national gravity net, and regional surveys are summarized. Instrument developments are described. High precision gravity measurements and gravity variations with time are discussed. Measurements of gravity at sea are outlined. Geodetic and geophysical evaluation of gravity data is considered.
Author (ESA)

N84-19949 Bayerische Akademie der Wissenschaften, Munich (West Germany).
MATHEMATICAL THEORIES, NUMERICAL INVESTIGATIONS c64
Karl Heinz Ilk *In its* Natl. Rept. of Federal Republic of Germany on Geodetic Acticities, 1979 - 1983 1983 p 142-189 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

Mathematical models and methods for estimating stochastic

and nonstochastic parameters of models for operational geodesy are reviewed. Geodetic modeling for the recovery of global and local geokinematic parameters is discussed. Geodetic data management and computer program development are summarized. Author (ESA)

N84-19950 Bayerische Akademie der Wissenschaften, Munich (West Germany).
PHYSICAL GEODESY c43
E. W. Grafarend, E. H. Knickmeyer, H. Kremers, and W. Lindlohr *In its* Natl. Rept. of Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 190-218 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

An annotated bibliography of over 100 items on satellite altimetry, gravity gradiometry, very long base interferometry, and collocation methods for geodetic data analysis is presented. Author (ESA)

N84-19951 Bayerische Akademie der Wissenschaften, Munich (West Germany).
EARTH TIDES c43
Manfred Bonatz *In its* Natl. Rept. of Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 220-230 refs In GERMAN; ENGLISH summary (For primary document see N84-19942 10-42)
Avail: Issuing Activity

Three-component-sensors, strain meters; tiltmeters and determination of systemical instrumental errors in Earth tide investigations are discussed. Data acquisition automatization, preprocessing, permanent stations; long term observation; temporary stations, and short term observation (clinometric profile and array measurements) are considered. Determination of local disturbing effects in a tunnel are described. Results of clinometric observations, strain measurements, modeling of effects of inhomogeneity are presented. Gravimetric tidal corrections, applications of tilt observation to prediction of storm surges, and earthquake research are mentioned. Tides at the South Pole, geology effects, tidal friction, dispersion effects, tidal phases and viscosity of the Earth, resonance effects of the liquid core, and determination of nontidal signals are treated. Author (ESA)

N84-19952 Bayerische Akademie der Wissenschaften, Munich (West Germany).
RECENT CRUSTAL MOVEMENTS c46
Hermann Maelzer *In its* Natl. Rept. of Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 231-251 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

Calculation of temporal height changes for the determination of recent vertical crustal movements in northern, western, and southern Germany is described. Precise geodetic measurements and their analysis for the determination of recent crustal movements in north-eastern Iceland, western Venezuela, and central Peru are described. Determination of recent vertical crustal movements by leveling and gravity data; geodetic modeling of deformations and recent crustal movements; geodetic modeling of plate motions; and instrumental developments in geodetic measuring are discussed. Author (ESA)

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-19953*# Southern Methodist Univ., Dallas, Tex. Center for Applied Mathematical and Statistical Research.
CENTER OF EXCELLENCE FOR APPLIED MATHEMATICAL AND STATISTICAL RESEARCH IN SUPPORT OF DEVELOPMENT OF MULTICROP PRODUCTION MONITORING CAPABILITY Final Report, 1 Feb. - 31 Aug. 1983
Wayne A. Woodward and H. L. Gray Aug. 1983 101 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development
(Contract NAS9-16438; Proj. AgRISTARS)
(E84-10062; NASA-CR-171729; SR-63-04444; NAS 1.26:171729) Avail: NTIS HC A06/MF A01 CSCL 02C

Efforts in support of the development of multicrop production monitoring capability are reported. In particular, segment level proportion estimation techniques based upon a mixture model were investigated. Efforts have dealt primarily with evaluation of current techniques and development of alternative ones. A comparison of techniques is provided on both simulated and LANDSAT data along with an analysis of the quality of profile variables obtained from LANDSAT data. M.G.

N84-19954*# Ocean Weather, Inc., Cos Cob, Conn.
POTENTIAL IMPACT OF REMOTE SENSING DATA ON SEA-STATE ANALYSIS AND PREDICTION Final Report, 1 Mar. 1982 - 31 Dec. 1983
Vincent J. Cardone Dec. 1983 105 p refs ERTS
(Contract NAS5-26890)
(E84-10083; NASA-CR-175209; NAS 1.26:175209) Avail: NTIS HC A06/MF A01 CSCL 08C

The severe North Atlantic storm which damaged the ocean liner Queen Elizabeth 2 (QE2) was studied to assess the impact of remotely sensed marine surface wind data obtained by SEASAT-A, on sea state specifications and forecasts. Alternate representations of the surface wind field in the QE2 storm were produced from the SEASAT enhanced data base, and from operational analyses based upon conventional data. The wind fields were used to drive a high resolution spectral ocean surface wave prediction model. Results show that sea state analyses would have been vastly improved during the period of storm formation and explosive development had remote sensing wind data been available in real time. A modest improvement in operational 12 to 24 hour wave forecasts would have followed automatically from the improved initial state specification made possible by the remote sensing data in both numerical and sea state prediction models. Significantly improved 24 to 48 hour wave forecasts require in addition to remote sensing data, refinement in the numerical and physical aspects of weather prediction models. A.R.H.

N84-19955*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
L BAND PUSH BROOM MICROWAVE RADIOMETER: SOIL MOISTURE VERIFICATION AND TIME SERIES EXPERIMENT DELMARVA PENINSULA
T. J. Jackson (Agricultural Research Center, Beltsville, Md.), J. Shiue, P. ONeill, J. Wang, J. Fuchs, and M. Owe Feb. 1984 76 p refs ERTS
(E84-10084; NASA-TM-86068; NAS 1.15:86068) Avail: NTIS HC A05/MF A01 CSCL 08M

The verification of a multi-sensor aircraft system developed to study soil moisture applications is discussed. This system consisted of a three beam push broom L band microwave radiometer, a thermal infrared scanner, a multispectral scanner, video and photographic cameras and an onboard navigational instrument. Ten flights were made of agricultural sites in Maryland and Delaware with little or no vegetation cover. Comparisons of aircraft and ground measurements showed that the system was reliable and consistent. Time series analysis of microwave and evaporation data showed a strong similarity that indicates a potential direction for future research. M.G.

N84-19956*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADAR RESPONSE FROM VEGETATION WITH NODAL STRUCTURE
Bruce J. Blanchard and Peggy E. ONeill Feb. 1984 21 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198

ERTS
(E84-10085; NASA-TM-86066; NAS 1.15:86066) Avail: NTIS HC A02/MF A01 CSCL 02C

Radar images from the SEASAT synthetic aperture radar (SAR) produced unusually high returns from corn and sorghum fields, which seem to indicate a correlation between nodal separation in the stalk and the wavelength of the radar. These images also show no difference in return from standing or harvested corn. Further investigation using images from the Shuttle Imaging Radar (SIR-A) substantiated these observations and showed a degradation of the high return with time after harvest. From portions of corn and sweet sorghum stalks that were sampled to measure stalk water content, it was determined that near and after maturity the water becomes more concentrated in the stalk nodes. The stalk then becomes a linear sequence of alternating dielectrics as opposed to a long slender cylinder with uniform dielectric properties. M.G.

N84-19957*# Research and Data Systems, Inc., Lanham, Md.
AN ANALYSIS OF NEW TECHNIQES FOR RADIOMETRIC CORRECTION OF LANDSAT-4 THEMATIC MAPPER IMAGES
John Kogut, Eliane Larduinat, and Maureen Fitzgerald 20 Oct. 1983 29 p ERTS
(Contract NAS5-27371)
(E84-10086; NASA-CR-175179; NAS 1.26:175179) Avail: NTIS HC A03/MF A01 CSCL 08B

The utility of methods for generating TM RLUTS which can improve the quality of the resultant images was investigated. The TM-CCT-ADDS tape was changed to account for a different collection window for the calibration data. Several scenes of Terrebonne Bay, Louisiana and the Grand Bahamas were analyzed to evaluate the radiometric corrections operationally applied to the image data and to investigate several techniques for reducing striping in the images. Printer plots for the TM shutter data were produced and detector statistics were compiled and plotted. These statistics included various combinations of the average shutter counts for each scan before and after DC restore for forward and reverse scans. Results show that striping is caused by the detectors becoming saturated when they view a bright cloud and depress the DC restore level. A.R.H.

N84-19958*# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
CROP AREA ESTIMATION BASED ON REMOTELY-SENSED DATA WITH AN ACCURATE BUT COSTLY SUBSAMPLE Final Report, 1 Jan. - 30 Oct. 1983
Richard F. Gunst 30 Oct. 1983 97 p refs ERTS
(Contract NCC9-9)
(E84-10087; NASA-CR-171731; NAS 1.26:171731) Avail: NTIS HC A05/MF A01 CSCL 02C

Alternatives to sampling-theory stratified and regression estimators of crop production and timber biomass were examined. An alternative estimator which is viewed as especially promising is the errors-in-variable regression estimator. Investigations established the need for caution with this estimator when the ratio of two error variances is not precisely known. A.R.H.

N84-19959*# Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research.
INCREASE OF COLD TOLERANCE IN COTTON PLANT (GOSSYPIUM HIRSUTUM L.) BY MEPIQUAT CHLORIDE
H. W. Gausman, D. E. Escobar, R. R. Rodriguez, Principal Investigators, S. Y. Huang (Texas A and M Univ., Weslaco), and F. R. Rittig (BASF Experiment Station, Limburgerhof, West Germany) Feb. 1982 10 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E84-10088; NASA-CR-175383; EW-U2-04243; JSC-17817; NAS 1.26:175383) Avail: NTIS HC A02/MF A01 CSCL 02C

Three mepiquat chloride (MC) concentrations - 40, 70, and 100 g a.i./ha - were used to spray cotton (Gossypium hirsutum L., cultival McNair 220) plants to determine whether or not MC would increase their cold tolerance. Seven to ten days after the spray, the plants were exposed to three different cold treatments. No important difference in cold damage was noticed between the control and the MC-treated plants when they were exposed repeatedly to 4.5 C. No plants died when exposed to 0.5 C for 12 h; however, 90% of the 1st and 2nd leaves of the control plants were damaged. This was three times more damage than those leaves of plants treated with 70 and 100 g a.i./ha MC concentrations; 60% f the control and 10-20% of the MC-treated plants died when the plants were subjected to a cold hardening process with 15.5 C day (12 h) and 1.7 C night (12 h) for 10 days, and then, held at -2.2 C for 24 hours. The electrolyte leakage and reflectance measurement data showed that the cell membranes of the MC-treated plants sustained much less damage than those of the control. Freezing injury was easily assessed by reflectance measurements at the 1.65 micrometer wavelength. Author

N84-19960*# Agricultural Research Service, Weslaco, Tex. Remote Sensing Research Unit.
REFLECTANCE MEASUREMENTS OF COTTON LEAF SENESCENCE ALTERED BY MEPIQUAT CHLORIDE
H. W. Gausman, D. E. Escobar, and R. R. Rodriguez, Principal Investigators Feb. 1982 15 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E84-10089; NASA-CR-175384; EW-U2-04244; JSC-17818; NAS 1.26:175384) Avail: NTIS HC A02/MF A01 CSCL 02C

Spectrophotometric reflectance measurements were made on plant-attached leaves to evaluate growth chamber-grown cotton leaf (Gossypium hirsutum L.) senescence (chlorophyll degradation as criterion) that was delayed by mepiquat chloride (1,1-dimethylpiperidinium chloride) rates of 0, 10, 40, 70, and 100 g a.i./ha. Mepiquat chloride (MC increased both chlorophyll and leaf water contents as compared with that of untreated leaves. Reflectance was inversely and linearly correlated ($r = -0.873^{**}$) with eater content at the 1.65 micrometer wavelength and was inversely correlated ($r = -0.812^{**}$) with chlorophyll concentration at the 0.55 micrometer wavelength but best fit a quadratic equation. Either wavelength measurement might be useful to remotely detect cotton leaf senescence or fields of MC-treated cotton plants. Author

N84-19961*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ACCOMPLISHMENTS OF THE NASA JOHNSON SPACE CENTER PORTION OF THE SOIL MOISTURE PROJECT IN FISCAL YEAR 1981 Annual Report, 1981
J. F. Paris, L. M. Arya, S. A. Davidson, W. W. Hildreth, J. C. Richter, and W. A. Rosenkranz Jan. 1982 95 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with Lockheed Engineering and Management Services Co., Inc., Houston, Tex. ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E84-10090; NASA-TM-85562; SM-L1-04209; JSC-17798; NAS 1.15:85562; LEMSCO-17305) Avail: NTIS HC A05/MF A01 CSCL 02C

The NASA/JSC ground scatterometer system was used in a row structure and row direction effects experiment to understand these effects on radar remote sensing of soil moisture. Also, a modification of the scatterometer system was begun and is continuing, to allow cross-polarization experiments to be conducted in fiscal years 1982 and 1983. Preprocessing of the 1973 agricultural soil moisture experiment (ASME) data was completed. Preparations for analysis of the ASME data is fiscal year 1982 were completed. A radar image simulation procedure developed by the University of Kansas is being improved. Profile soil moisture model outputs were compared quantitatively for the same soil and climate conditions. A new model was developed and tested to predict the soil moisture characteristic (water tension versus volumetric soil moisture content) from particle-size distribu-

tion and bulk density data. Relationships between surface-zone soil moisture, surface flux, and subsurface moisture conditions are being studied as well as the ways in which measured soil moisture (as obtained from remote sensing) can be used for agricultural applications. A.R.H.

N84-19962*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AGRISTARS: AGRICULTURE AND RESOURCES INVENTORY SURVEYS THROUGH AEROSPACE REMOTE SENSING Annual Report, 1981
Jan. 1982 89 p ERTS
(E84-10091; NASA-TM-85558; AP-J2-04225; NAS 1.15:85558) Avail: NTIS HC A05/MF A01 CSCL 02C

The rationale, objectives, participants, and approach of the AgRISTARS program are described. Progress is reported in activities related to early warning and crop condition assessment; inventory technology development (formerly foreign commodity production forecasting); yield model development; supporting research; soil moisture; renewable resources inventory; domestic crops and land cover; and conservation and pollution. Emphasis is on technological highlights. A.R.H.

N84-19963*# Dartmouth Coll., Hanover, N.H.
INVESTIGATION OF FORESTRY RESOURCES AND OTHER REMOTE SENSING DATA. 1: LANDSAT. 2: REMOTE SENSING OF VOLCANIC EMISSIONS Final Technical Report, 1 Feb. 1980 - 31 Oct. 1983
Richard W. Birnie and Richard E. Stoiber, Principal Investigators 31 Oct. 1983 81 p refs ERTS
(Contract NCC5-22)
(E84-10092; NASA-CR-175385; NAS 1.26:175385) Avail: NTIS HC A05/MF A01 CSCL 08K

Computer classification of LANDSAT data was used for forest type mapping in New England. The ability to classify areas of hardwood, softwood, and mixed tree types was assessed along with determining clearcut regions and gypsy moth defoliation. Applications of the information to forest management and locating potential deer yards were investigated. The principal activities concerned with remote sensing of volcanic emissions centered around the development of remote sensors for SO2 and HCl gas, and their use at appropriate volcanic sites. Two major areas were investigated (Masaya, Nicaragua, and St. Helens, Washington) along with several minor ones. M.G.

N84-19964*# Delaware Univ., Newark. Coll. of Marine Studies.
EVALUATION OF SPATIAL, RADIOMETRIC AND SPECTRAL THEMATIC MAPPER PERFORMANCE FOR COASTAL STUDIES Quarterly Status Technical Progress Report, 1 Oct. - 31 Dec. 1983
V. Klemas, Principal Investigator 31 Dec. 1983 4 p ERTS
(Contract NAS5-27580)
(E84-10093; NASA-CR-175386; NAS 1.26:175386) Avail: NTIS HC A02/MF A01 CSCL 08B

A series of experiments were initiated to determine the feasibility of using thematic mapper spectral data to estimate wetlands biomass. The experiments were conducted using hand-held radiometers simulating thematic mapper wavebands 3, 4 and 5. Spectral radiance data were collected from the ground and from a low altitude aircraft in an attempt to gain some insight into the potential utility of actual thematic mapper data for biomass estimation in wetland plant communities. In addition, radiative transfer models describing volume reflectance of eight water column containing submerged aquatic vegetation were refined. M.G.

N84-19965*# State Univ. of New York, Albany.
[DEMONSTRATION OF ANGULAR ANISOTROPY IN THE OUTPUT OF THEMATIC MAPPER] Quarterly Status Technical Progress Report
M. J. Duggin, Principal Investigator, J. Lindsay, D. J. Piwinski, and L. B. Schoch 11 Feb. 1984 135 p ERTS
(Contract NAS5-27595)
(E84-10095; NASA-CR-175387; NAS 1.26:175387) Avail: NTIS HC A07/MF A01 CSCL 08B

There is a dependence of TM output (proportional to scene radiance in a manner which will be discussed) upon season, upon cover type and upon view angle. The existence of a significant systematic variation across uniform scenes in p-type (radiometrically and geometrically pre-processed) data is demonstrated. Present pre-processing does remove the effects and the problem must be addressed because the effects are large. While this is in no way attributable to any shortcomings in the thematic mapper, it is an effect which is sufficiently important to warrant more study, with a view to developing suitable pre-processing correction algorithms. A.R.H.

N84-19966*# Canada Centre for Remote Sensing, Ottawa (Ontario).
CCRS PROPOSAL FOR EVALUATING LANDSAT-4 MSS AND TM DATA Progress Report, 3 Sep. 1983 - 2 Jan. 1984
W. M. Strome, J. Cihlar, D. G. Goodenough, F. E. Guertin, Principal Investigators, B. Guindon, J. Murphy, J. M. Butlin, P. Duff, A. Fitzgerald, G. Grieve et al 26 Jan. 1984 35 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E84-10096; NASA-CR-175388; NAS 1.26:175388; PR-2) Avail: NTIS HC A03/MF A01 CSCL 05B

The measurement of registration errors in LANDSAT MSS data is discussed as well as the development of a revised algorithm for the radiometric calibration of TM data and the production of a geocoded TM image. For individual titles, see N84-19967 through N84-19970.

N84-19967*# Canada Centre for Remote Sensing, Ottawa (Ontario).
REVISED RADIOMETRIC CALIBRATION TECHNIQUE FOR LANDSAT-4 THEMATIC MAPPER DATA BY THE CANADA CENTRE FOR REMOTE SENSING
J. Murphy, T. Butlin, P. Duff, and A. Fitzgerald (Ball (Roy) Associates) *In its* Proposal for Evaluating LANDSAT-4 MSS and TM Data 26 Jan. 1984 4 p ERTS (For primary document see N84-19966 10-43)
Avail: NTIS HC A03/MF A01 CSCL 08B

Observations of raw image data, raw radiometric calibration data, and background measurements extracted from the raw data streams on high density tape reveal major shortcomings in a technique proposed by the Canadian Center for Remote Sensing in 1982 for the radiometric correction of TM data. Results are presented which correlate measurements of the DC background with variations in both image data background and calibration samples. The effect on both raw data and data corrected using the earlier proposed technique is explained and the correction required for these factors as a function of individual scan line number for each detector is described. How the revised technique can be incorporated into an operational environment is demonstrated. A.R.H.

N84-19968*# Canada Centre for Remote Sensing, Ottawa (Ontario).
REVISED RADIOMETRIC CALIBRATION TECHNIQUE FOR LANDSAT-4 THEMATIC MAPPER DATA
J. Murphy, T. Butlin, P. Duff, and A. Fitzgerald (Ball (Roy) Associates) *In its* Proposal for Evaluating LANDSAT-4 MSS and TM Data 26 Jan. 1984 22 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N84-19966 10-43)
Avail: NTIS HC A03/MF A01 CSCL 05B

Depending on detector number, there are random fluctuations in the background level for spectral band 1 of magnitudes ranging from 2 to 3.5 digital numbers (DN). Similar variability is observed in all the other reflective bands, but with smaller magnitude in the range 0.5 to 2.5 DN. Observations of background reference levels show that line dependent variations in raw TM image data and in

the associated calibration data can be measured and corrected within an operational environment by applying simple offset corrections on a line-by-line basis. The radiometric calibration procedure defined by the Canadian Center for Remote Sensing was revised accordingly in order to prevent striping in the output product. A.R.H.

N84-19969*# Canada Centre for Remote Sensing, Ottawa (Ontario).
LANDSAT-4 MSS INTERBAND REGISTRATION
G. Grieve and R. Simard *In its* Proposal for Evaluating LANDSAT-4 MSS and TM Data 26 Jan. 1984 2 p ref ERTS (For primary document see N84-19966 10-43)
Avail: NTIS HC A03/MF A01 CSCL 05B

Interband registration on raw LANDSAT-4 MSS data was measured in the four MSS bands of the Mistassini, Quebec scene (path-row 16-24, June 21, 1983). Statistical comparison between line-pixel locations of uniformly distributed ground control points in the four different bands permitted quantitative measures of the offset over the entire scene. The statistical distribution of the offset measures permitted evaluation of the standard error on the mean values, giving confidence on their precision. Results obtained using a manual ground control point done on a digital image correction system and those obtained using digital band-to-band correlation adapted from a digital stereographic correlation algorithm are tabulated. The pixel misrepresentation values obtained are compared with published NASA figures. A.R.H.

N84-19970*# Canada Centre for Remote Sensing, Ottawa (Ontario).
LANDSAT-MSS MULTITEMPORAL REGISTRATION
G. Grieve and R. Simard *In its* Proposal for Evaluating LANDSAT-4 MSS and TM Data 26 Jan. 1984 2 p ERTS (For primary document see N84-19966 10-43)
Avail: NTIS HC A03/MF A01 CSCL 05B

The multitemporal registration of LANDSAT-4 MSS products was tested for two different geocoded subscenes acquired in 1982 and 1983. The scenes were then compared with LANDSAT-2 MSS geocoded data from 1981. Statistical comparison between line-pixel locations of uniformly distributed ground control points in the three geocoded products permitted quantitative measure of the offset over the sub-scene. Values of line and pixel misregistration obtained using the manual ground control points and digital correlation are tabulated and discussed. A.R.H.

N84-19971# LANDSAT Technical Working Group.
PROCEEDINGS OF THE FOURTH MEETING OF THE LANDSAT TECHNICAL WORKING GROUP (LTWG). ATTACHMENTS
1983 349 p refs Meeting held in Frascati, Italy, 19-21 Apr. 1983
(LIB-PRO-0012) Avail: NTIS HC A15/MF A01

The performance of LANDSAT remote sensing and data transmission systems is assessed and methods are discussed for radiometric and geometric correction. Standard formats for data products and options for LANDSAT 4 TM data distribution to ground stations are considered. For individual titles, see N84-19972 through N84-19984.

N84-19972# LANDSAT Technical Working Group.
LANDSAT-D COMMUNICATION SYSTEMS IN-ORBIT PERFORMANCE
In its Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 2 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

The LANDSAT-4 communication systems performed exceptionally well in-orbit. Data were gathered from the transportable ground station and some STDN stations. Actual signal level recordings are given for the X-band link, the direct access S-band, the S-band telemetry link, and the STDN command link. A.R.H.

N84-19973# LANDSAT Technical Working Group.
LANDSAT-4 STATUS
E. Conlan *In its* Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 15 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

Responsibilities of the NOAA division in charge of LANDSAT satellite system operations are listed. Charts show spacecraft status, current LANDSAT operation, operational capability, average power available per panel configuration, the processing status of MSS and TM data, and EDC performance. A.R.H.

N84-19974# National Oceanic and Atmospheric Administration, Washington, D. C.
LANDSAT-4 COMMERCIALIZATION UPDATE
Ken Hodgkins *In* LANDSAT Tech. Working Group Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 14 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

A synopsis of a proposed master schedule for transferring civil remote sensing satellites to the private sector is presented along with the statement of the Secretary of Commerce before House Committees in which the administration's proposal is presented and defended. A.R.H.

N84-19975# Canada Centre for Remote Sensing, Ottawa (Ontario).
RADIOMETRIC CALIBRATION AND GEOCODED PRECISION PROCESSING OF LANDSAT-4 MSS PRODUCTS
Jennifer Murphy, D. Bennett, and F. Guertin *In* LANDSAT Tech. Working Group Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 31 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

The stability of the calwedge is being monitored by CCRS for two major purposes. Firstly, it is advisable to select as reference detectors for absolute calibration purposes the detector within each band which is most reliable in terms of both long term stability and constancy within one scene. Secondly, any long term drift in the absolute calibration of the MSS sensor should be monitored for quality assessment purposes. Author

N84-19976# National Space Development Agency, Tokyo (Japan).
OPERATIONAL STATUS OF THE LANDSAT-5 GROUND STATION
In LANDSAT Tech. Working Group Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 3 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

The status of receiving and recording LANDSAT 4 S-band MSS data is examined as well X-band test reception. Problems solved involve modulation mode and frequency change of received USB telemetry and auto-tracking loss due to USB received AGC level change. The LANDSAT 4 data processing system is summarized and the implementation of the standard format for MSS CCT's is reported. Changes were made to the MSS data processing system for longitude/latitude tickmark coordination, and improvement of radiometric correction. A.R.H.

N84-19977# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CURRENT STATUS OF TH BRAZILIAN LANDSAT FACILITIES Progress Report, 1 Oct. 1982 - 31 Mar. 1983
Marcio Nogueira Barbosa and Jose Borges Escada, Jr. *In* LANDSAT Tech. Working Group Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 21 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

The current status of Brazilian facilities for LANDSAT data is discussed including the Cuiaba tracking and receiving station; electronic and photographic processing laboratories, and the data distribution centers. Subsystems for receiving, recording, and processing LANDSAT 4 data are described as well as the preliminary TM products produced. A.R.H.

N84-19978# National Space Development Agency, Tokyo (Japan).
DESCRIPTION AND STATUS REPORT ON TM PROCESSING SYSTEM
In LANDSAT Tech. Working Group Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 6 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

The TM processing system consists of two independent computer subsystems; TM-IDPS (Image Data Processing Subsystem) and TM-PGS (product generation subsystem). The TM-IDPS feeds TM data reproduced from the high density digital recorder and performs, radiometric and geometric corrections. Processed data are output into CCT's. The TM-PGS is for exposing TM image upon a 240 mm film and for copying CCT's. The hardware structure, system performance, and products are discussed. A schedule is given for the development of systems for recording, receiving and processing data, for products generation, and for photographics for both the TM and the MSS. A.R.H.

N84-19979*# National Aeronautics and Space Administration, Washington, D. C.
NASA TM PROCESSING SYSTEM DESCRIPTION AND STATUS
W. Watt *In* LANDSAT Tech. Working Group Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 32 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01 CSCL 17B

An overview of the processing system for LANDSAT 4 imagery is given. Charts show system requirements; the LANDSAT 4 ground segment with its elements, configurations, and data flow; image generation requirements; and the major functions, interfaces, and hardware of the image generation facility and the image processing systems for the TM and MSS. The laser beam film recorder and the high density digital recorder are covered as well as the data available at EDC. A.R.H.

N84-19980# EROS Data Center, Sioux Falls, S. Dak.
TM DATA AVAILABLE AT EDC, AND EDC TM DATA HANDLING AND PROCESSING PLAN
In LANDSAT Tech. Working Group Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 39 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

Pixel values of LANDSAT 4 MSS detectors are plotted and other graphs show the MSS spectral response and TM calibration data by pixel position. Tables show postlaunch radiometric calibration of TM data, and spectral radiance values. The plan for processing and handling TM data is presented including basic workflow, section responsibilities, impacts, and assumptions at EDC. Anticipated software requirements are included. A.R.H.

N84-19981# National Oceanic and Atmospheric Administration, Washington, D. C.
NOAA POSITION FOR TM DATA DISTRIBUTION
E. Conlan *In* LANDSAT Tech. Working Group Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 23 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

The layout of the 14 track raw TM data ground station tape is illustrated and specifications for recording are given. Topics covered include: demultiplexing; track assignment; randomizing; bit inversions and byte parity; digital coding; and high density digital recording frame format. The randomization code and internal controls are show in tables. A.R.H.

N84-19982# Canada Centre for Remote Sensing, Ottawa (Ontario).
CCRS OPTION FOR TM DATA DISTRIBUTION
Jenny Murphy *In* LANDSAT Tech. Working Group Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 4 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

The proposed HDR Control System should provide the means to distribute LANDSAT-4 thematic mapper data in downlink serial format on high density tape. While the data is not availale directly from the satellite via X-band transmission, TDRSS will provide the alternative means to obtain it. However, TDRSS data is not available directly to foreign stations, and the proposed system will allow the data to be distributed on each foreign station's high density medium. Data input to the system can be from either of two sources: by high speed dedicated line from NASA, in which case the system will be on NASA's premises; or temporarily on NASA's high density medium, in which case the system will be at CCRS for ease and economy of operation. The latter is likely to be the mode of operation for the first 8 months, until TDRSS is proven and a facility can be made ready for the system to be installed at NASA, Goddard. Author

N84-19983# European Space Agency, Frascati (Italy).
GEOMETRIC PERFORMANCE: LINE TO LINE DISPLACEMENT ANALYSIS
L. Fusco and W. Mehl *In* LANDSAT Tech. Working Group Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 32 p refs (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

An early acquired TM data frame (track 23, frame 35 of 22 August 1982) was used to assess the geometric performance of the LANDSAT-4 thematic mapper instrument. The developed method consists in determining the displacements of adjacent lines by locating the maximum of the correlation profile between the two lines. Then the line to line displacement is used to characterize the TM instrument in respect to: scan to scan jitter and image skew, scan profile non-linearity, along scan jitter, detector to detector displacement, and band to band displacement. To verify the quality of the reported performance parameters, some extracted geometric parameters were used to correct the original raw data. Comparison between P-tape data and results of reprocessed data shows no significant differences in an area of 1024 x 1024 pixels. A.R.H.

N84-19984# LANDSAT Technical Working Group.
SUMMARY OF LANDSAT TECHNICAL WORKING GROUP (LTWG) MEETINGS
In its Proc. of the Fourth Meeting of the LANDSAT Tech. Working Group (LTWG) 1983 24 p (For primary document see N84-19971 10-43)
Avail: NTIS HC A15/MF A01

Principal activities of the meetings are summarized and LANDSAT 4 technical information exchange is discussed from the viewpoints of background, cause, current status, and future plans. Current applications of the superstructure format standard and promulgation of the tape standard are discussed. Participants at the three previous LANDSAT Technical Working Group Meetings are listed along with the organizations they represent. A.R.H.

N84-19985# Geological Survey, Reston, Va. National Mapping Div.
RESEARCH, INVESTIGATIONS AND TECHNICAL DEVELOPMENTS: NATIONAL MAPPING PROGRAM, 1982
1983 90 p refs
(USGS-Open-File-83-568) Avail: NTIS HC A05/MF A01

Cartographic systems and techniques, digital cartographic systems, photogrammetry and surveying, image mapping, remote sensing data analysis, land use and land cover studies, and resource information studies are addressed. N.W.

N84-19986*# Wisconsin Univ., Madison. Space Science and Engineering Center.
THE SPECIAL EFFORT PROCESSING OF FGGE DATA Final Report
2 Mar. 1983 4 p refs
(Contract NAS5-26540)
(NASA-CR-175214; NAS 1.26:175214) Avail: NTIS HC A02/MF A01 CSCL 05B

The basic FGGE level IIb data set was enhanced. It focused on removing deficiencies in the objective methods of quality

assurance, removing efficiencies in certain types of operationally produced satellite soundings, and removing deficiencies in certain types of operationally produced cloud tracked winds. The Special Effort was a joint NASA-NOAA-University of Wisconsin effort. The University of Wisconsin installed an interactive McIDAS capability on the Amdahl computer at the Goddard Laboratory of Atmospheric Sciences (GLAS) with one interactive video terminal at Goddard and the other at the World Weather Building. With this interactive capability a joint processing effort was undertaken to reprocess certain FGGE data sets. NOAA produced a specially edited data set for the special observing periods (SOPs) of FGGE. NASA produced an enhanced satellite sounding data set for the SOPs while the University of Wisconsin produced an enhanced cloud tracked wind set from the Japanese geostationary satellite images. Author

N84-19987# Geological Survey, Reston, Va.
LAND USE AND LAND COVER DIGITAL DATA
Robin G. Fegeas, Robert W. Claire, Stephen C. Guptill, K. Eric Anderson, and Cheryl A. Hallam 1983 29 p refs
(GS-Circ-895-E) Avail: NTIS HC A03/MF A01

Some of the pertinent issues relative to digital cartographic data standards, are described, the digital cartographic data standards currently in use within the USGS are documented and the efforts of the USGS related to the definition of national digital cartographic data standards are detailed. The Geographic Information Retrieval and Analysis System that is used in conjunction with the USGS land use and land cover classification system to encode, edit, manipulate, and analyze land use and land cover digital data is described. Author

N84-19988*# Environmental Systems Research Inst., Redlands, Calif.
REVIEW AND SYNTHESIS OF PROBLEMS AND DIRECTIONS FOR LARGE SCALE GEOGRAPHIC INFORMATION SYSTEM DEVELOPMENT Final Report
A. R. Boyle, Jack Dangermond, Duane Marble, David S. Simonett, and Roger F. Tomlinson Apr. 1983 82 p
(Contract NAS2-11346)
(NASA-CR-166563; NAS 1.26:166563) Avail: NTIS HC A05/MF A01 CSCL 08B

Problems and directions for large scale geographic information system development were reviewed and the general problems associated with automated geographic information systems and spatial data handling were addressed. Author

N84-19989*# Agricultural Research Service, Beltsville, Md. Hydrology Lab.
COMPARISON OF THE INFORMATION CONTENT OF DATA FROM THE LANDSAT-4 THEMATIC MAPPER AND THE MULTISPECTRAL SCANNER Final Report
John C. Price [1984] 55 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198
(NASA Order S-10772-C)
(E84-10056; NASA-CR-173302; NAS 1.26:173302) Avail: NTIS HC A04/MF A01 CSCL 05B

The information contained in data from the visible and near-IR channels of the LANDSAT 4 thematic mapper (TM) and multispectral scanner (MSS) is evaluated for five agricultural scenes, leading to the conclusion that the TM provides a significant advance in information gathering capability as expressed in terms of bits per pixel or bits per unit area. The six reflective channels of the TM acquire 18 bits of information per pixel out of a possible 6 x (8 bits) = 48 bits, while the four MSS channels acquire 10 bits of information per pixel out of a possible 4x (7 bits) = 28 bits. Thus the TM and MSS are equally efficient in gathering information (18/48 = 10/28), contrary to the expected tendency toward lower efficiency as spatial resolution is improved and spectral channels are added to an observing system. The result is attributed to: (1) superior selection of spectral channels in the TM; (2) higher precision of the TM data, i.e., lower system noise; and (3) the advantage of higher spatial resolution, even in agricultural areas where fields are larger than the MSS pixel size. Because the MSS lacks a thermal IR channel, the 10-12 micrometer data of the TM at 120 m resolution are analyzed theoretically using an energy balance approach. It apppears that the TM thermal IR data are of interest mainly for mapping water bodies, which do not change temperature during the day, for assessing surface moistness, and for monitoring thermal features associated with human activity. M.G.

N84-19990# Naval Postgraduate School, Monterey, Calif.
AN ERROR ANALYSIS OF RANGE-AZIMUTH POSITIONING M.S. Thesis
D. A. Waltz Sep. 1983 104 p
(AD-A136775) Avail: NTIS HC A06/MF A01 CSCL 08/2

Pointing error standard deviations for two theodolites, the Wild T-2 and Odom Aztrac, were determined under conditions closely approximating those of range-azimuth or azimuth-azimuth hydrographic surveys. Pointing errors found for both instruments were about 1.3 meters, and were independent of distance. No statistical difference between the errors of the two instruments was found. The accuracy of the interpolation methods used by the National Ocean Service (NOS) for range-azimuth positioning were investigated, and an average inverse distance of about 2.5 meters was observed between interpolated positions and corresponding observed positions. The overall range-azimuth position errors of the two theodolites were then compared to positioning standards of NOS and the International Hydrographic Organization, using assumed ranging standard deviations of 1.0 and 3.0 meters. Both instruments met all standards except the NOS range-azimuth standard for 1:5,000 scale surveys. Interpolated positions may fail to meet more of the standards because of additional inherent error. Author (GRA)

N84-19991# SRI International Corp., Menlo Park, Calif. Artificial Intelligence Center.
INSTALLING A COPY OF THE ARPA/DMA IMAGE UNDERSTANDING TESTBED AT THE US ARMY ENGINEER TOPOGRAPHIC LABORATORIES Semiannual Technical Report, 30 - 31 Dec. 1983
Andrew J. Hanson 10 Jan. 1984 9 p
(Contract MDA903-82-C-0385; ARPA Order 3862)
(AD-A136999) Avail: NTIS HC A02/MF A01 CSCL 08/2

The principal objective of this effort is to establish a functional copy of the SRI Image Understanding (IU) Testbed system of hardware and software at the U. S. Army Engineer Topographic Laboratories (ETL) Research Institute at Fort Belvoir, Virginia. Initial tasks included advising on the preparation of the ETL site for the Testbed system installation, purchasing the required hardware and arranging for installation at ETL, and arranging for availability of Testbed software systems. Recent major tasks included assisting with several phases of hardware installation and testing, installing Testbed software systems, and developing support software to enhance the system's overall capabilities of the system. The ETL system is now functional as a node on the DDN MILNET network and interacts with a Symbolics Lisp Machine over a Chaosnet/Ethernet network. The main beneficial result of this effort is the transfer to ETL of a large body of research technology carried out by SRI and numerous other contributors to the DARPA Image Understanding research program. GRA

N84-19992# Graz Univ. (Austria). Inst. for Image Processing Computer Mapping.
IMPLEMENT OF THE COMPUTER PROGRAM-SYSTEM MOSS (MAP OVERLAY AND STATISTICAL SYSTEM) ON A VAX-11 SERIES COMPUTER UNDER VMS Interim Report, 1 Dec. - 31 Dec. 1983
F. Leberl Jan. 1984 14 p
(Contract DAJA45-84-C-0011; DA Proj. IT1-61102-BH-57)
(AD-A137104; IR-1) Avail: NTIS HC A02/MF A01 CSCL 08/2

The following activities are reported: Program source code has been read in from tape and most of the syntactic incompatibilities have been corrected. Standardization of file handling programs has been done. The concept of subprocesses as they are defined

under VAX-AMS has been introduced to support the intertask-communication of the MOSS-system, and An input module was written to get data from MDS into the MOSS database structure so that specific and well defined data are available for testing of the MOSS modules. MDS is a manual digitizing system developed at the Graz Research Center. A table of all MOSS commands and their current state of revision has been compiled and included in the report. GRA

N84-19993# Army Engineer Topographic Labs., Fort Belvoir, Va.
ON RECENT PROGRESS IN AND UTILIZATION OF ASTRO-GEODETIC-INERTIAL AND ASTROGEODETIC-GRADIOMETRIC GRAVITY VECTOR DETERMINATION
H. B. vonLuetzow Jun. 1983 11 p Presented at FIG 17th Intern. Congr., Sofia, 19-28 Jun. 1983
(AD-A136263) Avail: NTIS HC A02/MF A01 CSCL 08/5

Following an introductory status review, the paper presents a new astrogeodetic-gradiometric-inertial method for vertical deflection determination under consideration of horizontal channel interactions and suitable for the utilization of single of multiple track data in conjunction with supporting astrogeodetic deflections. It then discusses the problem of optimal deflection area adjustments under consideration of other work. Subsequently, accuracy aspects of astrogeodetic-gradiometric gravity vector determination based on the Bell gravity gradiometer, the simultaneous utilization of gradiometric and inertial data in terrestrial surveys, and potential applications are addressed. Author (GRA)

N84-19994# Royal Australian Navy Research Lab., Edgecliff.
COMPARISONS OF NAVAL AIR STATION, NOWRA OCEANOGRAPHIC ANALYSES WITH INDEPENDENTLY OBTAINED SHIP AND SATELLITE DATA
P. J. Mulhearn Sep. 1983 43 p
(AD-A136462; RANRL-TM(EXT)-4/83) Avail: NTIS HC A03/MF A01 CSCL 08/10

Comparisons are made between weekly oceanographic analyses prepared by the Naval Air Station, NOWRA, and independently obtained data from ship cruises and high resolution infra-red satellite imagery. Analyses prepared by Nowra were for sea-surface temperature, temperature at a depth of 250 m, and surface mixed-layer depth. Good agreement was found for the location of warm-core rings, through Nowra's use of satellite-tracked buoys. However the position of the Tasman Front was poorly determined in their analyses, because of the lack of adequate data. Methods of improving analyses and future prospects are discussed. Author (GRA)

N84-19995# Geological Survey, Denver, Colo.
AEROMAGNETIC MAP OF YUCCA MOUNTAIN AND SURROUNDING REGIONS, SOUTHWEST NEVADA
M. F. Kane and R. E. Bracken 1983 51 p refs
(Contract DE-AI08-78ET-44802)
(DE84-003920; USGS-OFR-83-616) Avail: NTIS HC A04/MF A01

Magnetic anomalies over Yucca Mountain and surrounding areas are largely caused by variations in magnetic properties and shapes, including structural offsets, of the extensive volcanic units that underlie the region. In a few places the anomalies are caused by intrusions. Correlation between magnetic properties measured from rock samples and those derived from rock unit-magnetic anomaly associations is excellent. Anomaly characteristics, extensive magnetic gradients, and marked changes in the regional magnetic field can be coupled with the magnetic properties of the rock units to delineate structural boundaries. Three major boundaries are indicated by contrasts in regional magnetic expressions. Less extensive but more clearly indicated boundaries in the immediate vicinity of Yucca Mountain are interpreted from a distinctive pairing of northerly-displacement in generally gently dipping volcanic beds. The displacement between beds is located approximately along the border line between the linear anomaly pairs. One series of pairs of more northeasterly trend lies over the general location of a change from moderately thick to very thick volcanic units that was interpreted from gravity data. Several low amplitude but distinctively shaped anomalies in areas underlain primarily by sedimentary strata indicate the presence of intrusions and faults. DOE

N84-19996# Texas Univ., Austin. Bureau of Economic Geology.
CONTINUITY AND INTERNAL PROPERTIES OF GULF COAST SANDSTONES AND THEIR !MPLICATIONS FOR GEOPRESSURED FLUID PRODUCTION
R. A. Morton, T. E. Ewing, and N. Tyler 1983 75 p refs
(Contract DE-AC08-79ET-27111)
(DE84-004396; Rept-of-Investigations-132; DOE/ET-27111/T2)
Avail: NTIS HC A04/MF A01

The intrinsic properties of the genetic sandstone units that typify many geopressured geothermal aquifers and hydrocarbon reservoirs in the Gulf Coast region were classified. The following topics are covered: structural and stratigraphic limits of sandstone reservoirs, characteristics and dimensions of Gulf Coast sandstones; fault compartment areas; comparison of production and geologic estimates of aquifer fluid volume; geologic setting and reservoir characteristics, Wells of Opportunity; internal properties of sandstones; and implications for geopressured fluid production. DOE

N84-19997# New Mexico State Univ., Las Cruces. Energy Inst.
STATE-COUPLED LOW TEMPERATURE GEOTHERMAL RESOURCE ASSESSMENT PROGRAM, FISCAL YEAR 1982 Final Technical Report
L. Icerman, ed. and A. Starkey, ed. Sep. 1983 294 p refs
(Contract DE-AS07-78ID-01717)
(DE84-002640; DOE/ID-01717/4) Avail: NTIS HC A13/MF A01

Separate abstracts were prepared for twelve papers. Topics include: Geothermal resource maps; geothermal exploratory; geothermal potential; temperature gradients; evaluation of Na-K, Na-Li, K-Li, SiO2 (Quartz), SiO2 (chalcedony), and Na-K-Ca geothermometers; aeromagnetic and Bouguer gravity maps; low temperature geothermal resource assessments. DOE

N84-19998# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DIGITAL SIGNAL PROCESSING IN COMPUTER AIDED CARTOGRAPHY Ph.D. Thesis - Bonn Univ. [DIGITALE SIGNALVERARBEITUNG IN DER RECHNERGESTUETZTEN KARTOGRAPHIE]
Ernst-Ulrich Fischer 1982 114 p refs In GERMAN
(Ser-C-278-Mitt-163; ISSN-0071-9196) Avail: NTIS HC A06/MF A01

Methods of digital signal processing in computer aided cartography are reviewed. The fundamentals of digital signal processing are presented, including discrete signals, linear systems, digital filters, theory of 2D-systems, and processing of binary 2D-signals. Practical applications in computer aided cartography are given, including processing of vector data, influence of errors, and processing of digital land models and raster data. Author (ESA)

N84-19999# Royal Netherlands Meteorological Inst., De Bilt. Afd. Fysisch Meteorologisch Onderzoek.
OBSERVATIONS OF SURFACE WATER TEMPERATURE AND SALINITY IN THE EASTERN PART OF THE EAST SCHELDT FROM 1921 UNTIL PRESENT
P. C. T. vanderHoeven and J. Muisjsert 1983 66 p In DUTCH; ENGLISH summary
(KNMI-TR-40(FM)) Avail: NTIS HC A04/MF A01

Measurements of water temperature and salinity in the southeastern part of the Dosterschelde (East Scheldt) are presented. Salinity data for 1966 to 1972 are very reliable, the remainder are less reliable. The observations of water temperature are much better. The series is used as a standard for the national temperature stations. Author (ESA)

N84-20000# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer

Hochfrequenztechnik.

BASIC INVESTIGATION ON THE FEASIBILITY OF MULTI-SPECTRAL RADIATION INFORMATION FROM MICROWAVE RADIOMETRY MEASUREMENTS FOR EARTH-SCIENTIFIC OBJECTIVES OF REMOTE SENSING Ph.D. Thesis - Freiburg Univ., West Germany

Rudolf H. Dittel Mar. 1983 375 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-846)

(DFVLR-FB-83-27; ESA-TT-846) Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 95

Multispectral microwave radiometry applied to remote sensing is considered. The data properties were estimated by signal analysis and statistical analysis. The radiant intensity in the 11, 32, and 90 GHz bands is sufficient for a coarse classification of single objects. Detailed investigation requires an extended spectral band > 90 GHz. Data reconstruction methods using a priori knowledge result in improved geometrical resolution by increase of the radiometric contrast. Modeling of object specific optical coefficients permits a comparison of scene contents detected under different environmental radiation conditions. Author (ESA)

N84-20001# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Bereich Raumfahrt Hess- und Regeltechnik.

MICROWAVE REMOTE SENSING EXPERIMENT FOR FIRST SPACELAB MISSION Final Report, Nov. 1982

Peter Heinecke, Robert Kremer, Manfred Boison, Rainer Ulbricht, Reinhard Loewens, and Hans-Joachim Reuther Bonn Bundesministerium fuer Forschung und technologie Nov. 1983 157 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-83-022; ISSN-0170-1339) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33

A microwave remote sensing experiment (MRSE) Spacelab payload for measuring vegetation parameters, geological structures, ocean waves, and state of ice and snow almost independent of solar position and weather conditions is presented. The MRSE comprises a synthetic aperture radar, a two-frequency scatterometer, and a passive radiometer. The operating frequency is in the X-band at 9.6 GHz. The power supply for the traveling wave tube within the high power amplifier is outlined. Author (ESA)

N84-20002# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.

FUTURE SEA MAPPING TECHNIQUE: TRAVEL REPORT. ACTIVITIES IN SEA MAPPING TECHNIQUE, LASER TECHNIQUE AND ACOUSTICS AT SOME INSTITUTES IN NORTHERN EUROPE

Tomas Claesson Dec. 1983 27 p refs In SWEDISH; ENGLISH summary

(FOA-C-30346-E1; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR50

Sea mapping techniques, and nautical chart production automation are discussed. Laser bathymetry, parallel depth measurements with several ships, interferometric side scan sonar, digital models for underwater, ground, and ultrasonic applications are reviewed. Position estimation using satellites is outlined. Author (ESA)

N84-20003# Geological Survey, Albany, N.Y. Water Resources Div.

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1982. VOLUME 3: WESTERN NEW YORK Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982

J. B. Hood, W. H. Johnston, H. J. Zajd, and H. L. Dixson Apr. 1983 220 p refs 3 Vol.

(PB84-119544; USGS/WRD/HD-83/038; USGS-WRD-NY-82/3) Avail: NTIS HC A10/MF A01 CSCL 08H

Water resources data for the 1983 water year for New York consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels of ground-water wells. This volume contains records for water discharge at 88 gaging stations; stage only at 14 gaging stations; stage and contents at 6 gaging stations and 2 other lakes and reservoirs; water quality at 14 gaging stations; 4 quality of precipitation stations; and water levels at 19 observation wells. Also included are data for 59 creststage and 2 low-flow partial-record stations. GRA

N84-20004# Geological Survey, Lakewood, Colo. Water Resources Div.

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1982. VOLUME 2: COLORADO RIVER BASIN ABOVE DOLORES RIVER Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982

R. C. Ugland, J. T. Steinheimer, J. L. Blattner, and R. G. Kretschman Jun. 1983 353 p refs 3 Vol.

(PB84-120138; USGS/WRD/HD-82/053; USGS/WRD/CO-82/2) Avail: NTIS HC A16/MF A01 CSCL 08H

Water-resources data for Colorado for the 1982 water year consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs, and water levels and water quality of wells and springs. This report contains discharge records for 408 gaging stations, stage and contents of 27 lakes and reservoirs, 6 partial-record low-flow stations, peak-flow information for 30 crst-stage partial-record stations, and 50 miscellaneous sites; water quality for 163 gaging stations and 245 miscellaneous sites; and water levels for 55 observation wells. Nine pertinent stations in bordering States also are included in this report. GRA

N84-20005# Bureau of Land Management, Denver, Colo.

THE USE OF REMOTE SENSING FOR SOILS INVESTIGATIONS ON BLM LANDS

William D. DiPaolo and Laura R. Hall May 1983 72 p refs

(PB84-132075; BLM-DCS-PT-83-003-4420; TN-361) Avail: NTIS HC A04/MF A01 CSCL 08M

This report primarily concerns use of LANDSAT digital data as an aid in the soil survey mapping efforts taking place on Federal, particularly BLM, lands in the western U.S. Its purpose is to help BLM personnel become more familiar with the use and potential of LANDSAT data for soil survey work. To better understand how LANDSAT data can be used in resource investigations, a brief description is given of the LANDSAT system and electromagnetic spectrum. The body of the report describes a project in southwestern Idaho where LANDSAT digital data was used as an aid in an Order 3 soil survey. GRA

N84-20006# Geological Survey, Austin, Tex. Water Resources Div.

WATER RESOURCES DATA TEXAS: WATER YEAR, 1982. VOLUME 1: ARKANSAS RIVER BASIN, RED RIVER BASIN, SABINE RIVER BASIN, NECHES RIVER BASIN, TRINITY RIVER BASIN AND INTERVENING COASTAL BASINS Water-Data Report, 1 Oct. 1981 - 30 Sep. 1982

Jun. 1983 552 p refs

(PB84-133271; USGS/WRD/HD-83/060; USGS/WDR/TX-82/1) Avail: NTIS HC A24/MF A01 CSCL 08H

Surface-water data for the 1982 water year for Texas are presented in three volumes, appropriately identified as to content by river basins. Data in each volume consist of records of stage, discharge, and water quality of streams and canals; and stage, contents, and water quality of lakes and reservoirs. Also included are crest-stage and flood-hydrograph partial-record stations, reconnaissance partial-record stations, and low-flow partial-record stations. GRA

N84-20007# Washington State Univ., Pullman.

COMMENTARY ON COLUMBIA RIVER INSTREAM FLOWS

H. D. Coop Aug. 1983 29 p refs

(Contract DI-14-34-0001-2151)

(PB84-133651; R-49; W84-00641; OWRT-A-113-WASH(1)) Avail: NTIS HC A03/MF A01 CSCL 08H

The Washington State Department of Ecology in 1980 adopted

the Columbia River Instream Resource Protection Plan (CRIRPP). This plan requires that flow rates in the river be at least at minimum specified levels (or higher) at all times. Columbia River flowrates are highly regulated by storage and hydropower plants. Plant discharge fluctuates accordingly to fairly well established power demands, particularly in low water years. CRIRPP requires that streamflow regulation would need to be modified so that outflows from plants are higher than at present. In turn, this means that power demand patterns would have to be modified, significant spill would be necessary, or some of both. There appears to be sufficient runoff, even in low runoff years, specifically, to meet CRIRPP requirements at Columbia River locations upstream from the Snake River confluence. Author (GRA)

N84-20008# Geological Survey, Bismarck, N. Dak.
WATER RESOURCES DATA FOR NORTH DAKOTA: WATER YEAR, 1982 Annual Report, 1 Oct. 1981 - 30 Sep. 1982
R. E. Harkness and N. D. Hatfield Sep. 1983 431 p refs
(PB84-136589; USGS/WRD/HD-82/081; USGS/WDR/ND-82/1) Avail: NTIS HC A19/MF A01 CSCL 08H

Water resources data for the 1982 water year for North Dakota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 110 gaging stations; stage only records for 21 gaging stations; stage and contents for 12 lakes and reservoirs; water quality for 114 gaging stations; 8 lakes, 67 wells, and water levels for 31 observation wells. GRA

N84-20009# Geological Survey, Iowa City, Iowa. Water Resources Div.
WATER RESOURCES DATA: IOWA WATER YEAR, 1982 Annual Report, 1 Oct. 1981 - 30 Sep. 1982
23 Aug. 1983 276 p refs
(PB84-137215; USGS/WRD-83/077; USGS/WDR/IA-82/1) Avail: NTIS HC A13/MF A01 CSCL 08H

Water resources data for the 1982 water year for Iowa consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 116 gaging stations; stage and contents for 7 lakes and reservoirs; water quality for 17 gaging stations; and water levels for 34 observations wells. Also included are 125 crest-stage partial-record stations. GRA

N84-20010# Scripps Institution of Oceanography, La Jolla, Calif.
SWIRLS AND PLUMES OR APPLICATION OF STATISTICAL METHODS TO SATELLITE-DERIVED SEA SURFACE TEMPERATURES Ph.D. Thesis
Kathryn Ann Kelly Aug. 1983 235 p refs
(Contract N00014-80-C-0440)
(AD-A135462; SIO-REF-83-15; TR-18) Avail: NTIS HC A11/MF A01 CSCL 08/10

The acquisition of a satellite receiving station combined with an intensive experiment (Coastal Ocean Dynamics Experiment) created an opportunity to analyze a series of infrared images of the California Current. Along with image analysis, measurements on the shelf and slope from current meters, hydrography, surface drifters, Doppler acoustic log, wind recorders, and tide gauges were monitored. The goals of the analysis were to develop a method for removing unusable data (clouds) and systematic errors, to extract a quantitative description of sea surface temperature (SST) patterns off northern California, to compare satellite-derived temperature with in situ measurements, to investigate the relationship between SST, wind and topography, and to estimate surface velocities from a series of images. M.A.C.

N84-19943 Bayerische Akademie der Wissenschaften, Munich (West Germany).
HORIZONTAL GEODESY CONTROL NETWORKS
R. Kelm and H.-J. Kriefall *In its* Natl. Rept. of The Federal Republic of Germany on Geodetic Activitie, 1979 - 1983 1983 p 8-48 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

N84-19944 Bayerische Akademie der Wissenschaften, Munich (West Germany).
PRECISE LEVELING
Rodulf Stuerzer *In its* Natl. Rept. of the Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 49-64 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

N84-19945 Bayerische Akademie der Wissenschaften, Munich (West Germany).
GEODETIC ASTRONOMY
Gerhard Soltau *In its* Natl. Rept. of the Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 65-76 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

N84-19947# Bayerische Akademie der Wissenschaften, Munich (West Germany).
THE GEODETIC USE OF SATELLITE OBSERVATIONS
Christoph Reigber *In its* Natl. Rept. of the Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 110-126 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

N84-19950 Bayerische Akademie der Wissenschaften, Munich (West Germany).
PHYSICAL GEODESY
E. W. Grafarend, E. H. Knickmeyer, H. Kremers, and W. Lindlohr *In its* Natl. Rept. of Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 190-218 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

N84-19951 Bayerische Akademie der Wissenschaften, Munich (West Germany).
EARTH TIDES
Manfred Bonatz *In its* Natl. Rept. of Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 220-230 refs In GERMAN; ENGLISH summary (For primary document see N84-19942 10-42)
Avail: Issuing Activity

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-20011* National Aeronautics and Space Administration, Washington, D. C.
ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, ISSUE 39
1983 345 p
(NASA-SP-7043(39); NAS 1.21:7043(39)) Avail: NTIS HC $15.00 CSCL 10B

This bibliography lists 1377 reports, articles and other documents introduced into the NASA scientific and technical information system from July 1, 1983 through September 30, 1983. Author

N84-20012*# National Aeronautics and Space Administration, Washington, D. C.
EVALUATION OF NICKEL-HYDROGEN BATTERY FOR SPACE APPLICATION
J. M. Billard and D. Dupont Oct. 1983 100 p Transl. into ENGLISH "Evaluation d'un Accumulateur Nickel Hydrogene a Usage Spatial" Rept. ESA-CR(P)-784 Societe des Accumulateurs Fixes et de Traction, Romainville, France, Oct. 1975 p 1-106 Original language document was announced as N76-20643 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77355; NAS 1.15:77355; ESA-CR(P)-784) Avail: NTIS HC A05/MF A01 CSCL 10C

Results of electrical space qualification tests of nickel-hydrogen battery type HR 23S are presented. The results obtained for the nickel-cadmium battery type VO 23S are similar except that the voltage level and the charge conservation characteristics vary significantly. The electrical and thermal characteristics permit predictions of the following optimal applications: charge coefficient in the order of 1.3 to 1.4 at 20C; charge current density higher than C/10 at 20C; discharge current density from C/10 to C/3 at 20C; maximum discharge temperature: OC; storage temperature: -20C. Author

N84-20013*# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemical Engineering.
ELECTROCATALYSIS OF FUEL CELL REACTIONS: INVESTIGATION OF ALTERNATE ELECTROLYTES Final Report, 1 Jan. 1982 - 31 Dec. 1983
Der-Tau Chin, K.-L. Hsueh, and H. H. Chang 1983 63 p refs
(NASA-CR-173261; NAS 1.26:173261) Avail: NTIS HC A04/MF A01 CSCL 10A

Oxygen reduction and transport properties of the electrolyte in the phosphoric acid fuel cell are studied. A theoretical expression for the rotating ring-disk electrode technique; the intermediate reaction rate constants for oxygen reduction on platinum in phosphoric acid electrolyte; oxygen reduction mechanism in trifluoromethanesulfonic acid (TFMSA), considered as an alternate electrolyte for the acid fuel cells; and transport properties of the phosphoric acid electrolyte at high concentrations and temperatures are covered. Author

N84-20014*# Eaton Corp., Southfield, Mich.
DEVELOPMENT OF A DC PROPULSION SYSTEM FOR AN ELECTRIC VEHICLE Final Report
W. L. Kelledes Jan. 1984 138 p refs
(Contracts DEN3-258; DE-AI01-77CS-51044)
(NASA-CR-168306; DOE/NASA/0258-1; NAS 1.26:168306; ERC-TR-83020) Avail: NTIS HC A07/MF A01 CSCL 10B

The suitability of the Eaton automatically shifted mechanical transaxle concept for use in a near-term dc powered electric vehicle is evaluated. A prototype dc propulsion system for a passenger electric vehicle was designed, fabricated, tested, installed in a modified Mercury Lynx vehicle and track tested at the contractor's site. The system consisted of a two-axis, three-speed, automatically-shifted mechanical transaxle, 15.2 Kw rated, separately excited traction motor, and a transistorized motor controller with a single chopper providing limited armature current below motor base speed and full range field control above base speed at up to twice rated motor current. The controller utilized a microprocessor to perform motor and vehicle speed monitoring and shift sequencing by means of solenoids applying hydraulic pressure to the transaxle clutches. Bench dynamometer and track testing was performed. Track testing showed best system efficiency for steady-state cruising speeds of 65-80 Km/Hz (40-50 mph). Test results include acceleration, steady speed and SAE J227A/D cycle energy consumption, braking tests and coast down to characterize the vehicle road load. Author

N84-20015*# Advanced Technology and Research, Inc., Burtonsville, Md.
INERTIAL ENERGY STORAGE HARDWARE DEFINITION STUDY (RING ROTOR)
J. A. Kirk and H. E. Evans Jan. 1984 123 p refs
(Contract NAS5-27654)
(NASA-CR-175271; NAS 1.26:175271; Rept-18401) Avail: NTIS HC A06/MF A01 CSCL 10C

Rotor analysis, interference stresses, fabrication/assembly, failure analysis, ring tolerances, stren plots, and drawings are discussed. Author

N84-20016*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROAD LOAD SIMULATOR TESTS OF THE GOULD PHASE 1 FUNCTIONAL MODEL SILICON CONTROLLED RECTIFIER ac MOTOR CONTROLLER FOR ELECTRIC VEHICLES Final Report
Francis Gourash Feb. 1984 70 p refs
(Contract DE-AI01-77CS-51044)
(NASA-TM-83497; E-1831; NAS 1.15:83497; DOE/NASA/51044-34) Avail: NTIS HC A04/MF A01 CSCL 10B

The test results for a functional model ac motor controller for electric vehicles and a three-phase induction motor which were dynamically tested on the Lewis Research Center road load simulator are presented. Results show that the controller has the capability to meet the SAE-J227a D cycle test schedule and to accelerate a 1576-kg (3456-lb) simulated vehicle to a cruise speed of 88.5 km/hr (55 mph). Combined motor controller efficiency is 72 percent and the power inverter efficiency alone is 89 percent for the cruise region of the D cycle. Steady state test results for motoring, regeneration, and thermal data obtained by operating the simulator as a conventional dynamometer are in agreement with the contractor's previously reported data. The regeneration test results indicate that a reduction in energy requirements for urban driving cycles is attainable with regenerative braking. Test results and data in this report serve as a data base for further development of ac motor controllers and propulsion systems for electric vehicles. The controller uses state-of-the-art silicon controlled rectifier (SCR) power semiconductors and microprocessor-based logic and control circuitry. The controller was developed by Gould Laboratories under a Lewis contract for the Department of Energy's Electric and Hybrid Vehicle program. Author

N84-20017*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTRIC VEHICLE PROPULSION ALTERNATIVES Final Report
Richard R. Secunde, Richard M. Schuh, and Raymond F. Beach Nov. 1983 65 p refs
(Contract DE-AI01-77CS-51044)
(NASA-TM-83504; E-1845; DOE/NASA/51044-33; NAS 1.15:83504) Avail: NTIS HC A04/MF A01 CSCL 10B

Propulsion technology development for electric vehicles is summarized. Analytical studies, technology evaluation, and the development of technology for motors, controllers, transmissions, and complete propulsion systems are included. Author

N84-20018# EIC, Inc., Newton, Mass.
HIGH ENERGY DENSITY LITHIUM PRIMARY CELLS USING NITROGEN CONTAINING POLYMER POSITIVES Technical Report
J. S. Foos and L. M. Rembetsy Dec. 1983 26 p
(Contract N00014-77-C-0155; NR Proj. 359-638)
(AD-A137377; C-480; TR-11) Avail: NTIS HC A03/MF A01 CSCL 10/3

It was proposed that nitrogen-containing, conductive polymers could be useful as cathode materials in lithium primary cells. The research consisted of the synthesis and evaluation of polymers and of monomeric model compounds. Polyaniline (aniline black) was identified as a promising cathode material. Generally, the desired polymers proved to be difficult to synthesize, in part due to their unique properties. Author (GRA)

N84-20019# Auburn Univ., Ala. Dept. of Civil Engineering.
DESIGN, PERFORMANCE, AND ANALYSIS OF AN AQUIFER THERMAL-ENERGY-STORAGE EXPERIMENT USING THE

DOUBLET-WELL CONFIGURATION
F. J. Molz, J. G. Melville, O. Gueven, and A. D. Parr Sep. 1983 141 p refs
(Contract DE-AC06-76RL-01830)
(DE84-001811; PNL-4849) Avail: NTIS HC A07/MF A01

In March 1980 Auburn University began a series of aquifer thermal energy storage (ATES) experiments using the doublet well configuration. The test site was in Mobile, Alabama. The objectives of the three experimental cycles were to demonstrate the technical feasibility of the ATES concept, to identify and resolve operational problems, and to acquire a data base for developing and testing mathematical models. Pre-injection tests were performed and analyses of hydraulic, geochemical, and thermodynamic data were completed. Three injection-storage-recovery cycles had injection volumes of 25,402 m(3), 58,010 m(3), and 58,680 m(3) and average injection temperatures of 58.50C, 81.00C. and 79.00C, respectively. The first cycle injection began in February 1981 and the third cycle recovery was completed in November 1982. Attributable to the doublet well configuration no clogging of injection wells occurred. Energy recovery percentages based on recovery volumes equal to the injection volumes were 56, 45, and 42%. Thermal convection effects were observed. Aquifer nonhomogeneity, not detectable using standard aquifer testing procedures, was shown to reduce recovery efficiency. DOE

N84-20020# Engineering and Economics Research, Inc., Vienna, Va.
SUPPLEMENT TO THE TECHNICAL ASSESSMENT OF GEOSCIENCE-RELATED RESEARCH FOR GEOTHERMAL ENERGY TECHNOLOGY Final Report
Dec. 1983 381 p
(Contract DE-AC01-82ER-30041)
(DE84-002373; DOE/ER-30041/T1) Avail: NTIS HC A17/MF A01

Detailed information (e.g., project title, sponsoring organization, research area, objective status, etc.) is presented for 338 geoscience/geothermal related projects. A summary of the projects conducted by sponsoring organization is presented and an easy reference to obtain detailed information on the number and type of efforts being sponsored is presented. The projects are summarized by research area (e.g., volcanology, fluid inclusions, etc.) and an additional project cross-reference mechanism is also provided. Subsequent to the collection of the project information, a geosciences classification system was developed to categorize each project by research area (e.g., isotope geochemistry, heat flow studies) and by type of research conducted (e.g., theoretical research, modeling/simulation). A series of matrices is included that summarize, on a project-by-project basis, the research area addressed and the type of R and D conducted. In addition, a summary of the total number of projects by research area and R and D type is given. DOE

N84-20021# Colorado Univ., Boulder.
DEGRADATION OF EVAPORATED ALUMINUM FILMS FOR SOLAR REFLECTIONS Final Report, 1 Jul. 1980 - 14 May 1983
J. L. Falconer 29 Jul. 1983 14 p refs
(Contract DE-FG02-80CS-83111)
(DE84-005341; DOE/CS-83111/T1) Avail: NTIS HC A02/MF A01

The mechanisms of degradation on aluminum using Auger electron spectroscopy, work function measurements, and mass spectrometry detection were studied. Aluminum was proposed as a possible solar thin film collector because of its high reflectivity. An ultrahigh vacuum system, which was connected through a valve to a high pressure system so that reactions could be carried out at atmospheric pressure was studied. Reactions of O2, CO, CO2 and NO were carried out on a series of evaporated aluminum films. The CO2 reactions on aluminum foil standard were examined. The effect of UV light and the effect of electron beams are studied, in particular, the electron beam effects from CO2 adsorption. DOE

N84-20022# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLAR THERMAL TECHNOLOGY PROGRAM: POLYMER SYNTHESIS AND CHARACTERIZATION SUBTASK, FY 1983 Annual Progress Report
P. Schissel and H. H. Neidlinger Dec. 1983 56 p refs
(Contract DE-AC02-83CH-10093)
(DE84-000094; SERI/PR-255-2148) Avail: NTIS HC A04/MF A01

Initial candidate methods for protecting the polymeric glazing and the metallic layer from degradation by ultraviolet light (UV) and candidate new polymeric materials were identified. The characteristics of photodegradation permit the application of methods involving both photon absorption and transfer of electronic energy. The radical copolymerization of monomeric UV absorbers with methylmethacrylate and related monomers for our initial system were selected. The first step is to evaluate absorbers mixed with the polymethylmethacrylate system. Mirrors are characterized by measuring the hemispherical reflectance as a function of wavelength and by determining the solar weighted hemispherical reflectance. It is demonstrated that UV absorbers added to polymethylmethacrylate can improve the weathering performance of mirrors. It is shown that benzotriazole absorbers stabilize polyester films where unstabilized plyacrylonitrile glazings also perform well. It is found that prior treatment of the mirror with UV light can improve the adhesion and that the process for silver deposition influences the initial reflectivity of silver mirrors. DOE

N84-20023# Radiation Monitoring Devices, Inc., Watertown, Mass.
LOW COST, SPRAYED CuInSe2 SOLAR CELL RESEARCH Annual Progress Report, 15 Sep. 1982 - 15 Sep. 1983
R. Tuvcotte, J. Lund, L. Moy, M. Squillante, and G. Entine 1983 28 p refs
(Contract DE-AC02-82ER-13026)
(DE84-005339; DOE/ER-13026/1; APR-1) Avail: NTIS HC A03/MF A01

A spray pyrolysis technique to deposit thin films of CuInSe2 for terrestrial solar cell applications was examined. The solution chemistry and process parameters needed to deposit CuInSe2 by this new method was studied. Very stable chemical spray solutions for CuInSe2 deposition were developed and CuInSe2 films which exhibited both p and n-type conductivity were deposited. The tailoring of the conductivity type was achieved by varying the solution concentration ratios of copper to indium. Preliminary Schottky barrier and heterojunction devices were fabricated and dramatic improvements in the device parameters were achieved. Open circuit voltages in excess of 350 mV, short circuit current densities up to 7 mA/cm(2) and fill factors up to 30% were observed. The devices remained stable for 3 months without any decrease in performance. The AM1 conversion efficiency is rapidly approaching 1.0%. DOE

N84-20024# Technischer Ueberwachungs-Verein Bayern e.V., Munich (West Germany). Fachbeteich Dampe- und Drucktechnik.
DEVELOPING OF PRACTICAL METHODS FOR THE DETERMINATION OF THE STAGNATION TEMPERATURE AND THE DURABILITY OF SOLAR COLLECTORS Final Report, Aug. 1982
Heinrich Wenzel and Anton Hoess Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 202 p refs In GERMAN; ENGLISH summary Presented at Status Seminar on Thermal Use of Solar Energy, Stuttgart, 21-24 Feb. 1983 Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-227; ISSN-0340-7608) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 37

Aging of indoor and outdoor solar collectors was studied using stagnation temperatures, and a 2.5 X 2 m solar simulator. The outdoor measured stagnation temperatures and the exponent for the interpolation and extrapolation to other solar radiations vary by 10% during the year. By permanent variations of the absorber temperatures at stagnant circulation the air between the

collector panel assembly and the ambient air was exchanged 20 times within 12 months. Climatic chamber weighing tests demonstrate that solar collectors absorb a water quantity of 10 to 500 g/sgm a week by vapor diffusion depending on design and material of the enclosure. By maintaining a constant enclosure temperature annual variations can be eliminated. Author (ESA)

N84-20025# AEG-Telefunken, Wedel (West Germany). Fachbereich Neue Technologien.

DEVELOPMENT AND PROTOTYPE PRODUCTION OF PHOTOVOLTAIC ENERGY SUPPLY SYSTEMS Final Report, Dec. 1982

Volker Cordes, Gerd Neuhaeuser, and Hans-Dieter Wegmann Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 242 p refs In GERMANY; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-83-238; ISSN-0340-7608) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 41

Cost reduction of photovoltaic power supply systems is examined. Single crystalline was replaced by multicrystalline silicon and production processes using low cost quick drawn crucible materials, high efficiency cells, and prepurified metallurgical cast silicon were developed. Large capacity production lines were constructed. All components were submitted to field tests. A production cost reduction by a factor of 10 is obtained.

Author (ESA)

N84-20026# Fraunhofer-Inst. fuer Festkoerpertechnologie, Munich (West Germany).

INVESTIGATION OF SILICON MATERIALS FOR SOLAR CELLS. PART 1: SEGREGATION AND GETTERING PROPERTIES OF CERTAIN CONTAMINATIONS. PART 2: MEASUREMENT OF ELECTRICAL PARAMETERS Final Report, Nov. 1981

Herrmann Sigmund and Helmut Bernt Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 86 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-83-204; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18

Solubility and segregation behavior of magnesium and calcium in silicon is studied. Doping was performed after melting epitaxy of Mg/Si and Ca/Si melts, and the probes were investigated by atomic absorption spectroscopy and deep-level transient spectroscopy. Maximum solubility of Mg is 1.5 times 10 to the 19th power/cucm, of Ca 6.0 times 10 to the 18th/cucm; the segregation coefficient at the melting point is 2.3/1000 for Mg and 1.6/1000 for Ca. By electrical measurements a relation between statistical spatial distribution of minority carrier lifetimes and the efficiency of solar cells is found. A method for contactless Measurement of lifetimes is suggested. Author (ESA)

N84-20027# Minnesota Dept. of Energy and Economic Development, St. Paul.

ZONING FOR WIND MACHINES: A GUIDE FOR MINNESOTA COMMUNITIES

Aug. 1983 43 p

(Contract DE-FG45-80CS-69105)

(PB84-129568; DEED-08-83) Avail: NTIS HC A03/MF A01 CSCL 10B

Information on wind machines and related zoning issues is provided enable planning and zoning staff and elected officials to make informed decisions on small wind machines will be addressed in community plans and zoning. Background information on wind machines is provided. Model zoning language with full discussions explaining the model provisions comprise the bulk of the guide. Zoning concerns addressed include definitions, use designation, size regulations, safety of installation and design, siting regulations, noise, and communications interference. Model planning goals and policies on use designation and wind access are provided. Model subdivisions regulations on facilitating siting of wind machines in areas of new development are also included. GRA

N84-19439# Centre National d'Etudes Spatiales, Toulouse (France).

SUN FOCUSING BY SATELLITE ANTENNA REFLECTORS [FOCALISATION DU SOLEIL PAR LES REFLECTEURS D'ANTENNE]

I. Alet *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 365-370 In FRENCH (For primary document see N84-19396 10-18)

Avail: NTIS HC A25/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-20028*# Miami Univ., Fla. School of Marine and Atmospheric Science.

OPTICAL THICKNESS AS RELATED TO POLLUTANT EPISODES AND THE CONCENTRATION OF VISIBILITY DEGRADING POLLUTANTS Final Report, Nov. 1981 - Nov. 1982

Joseph M. Prospero, Dennis Savoie, Thomas Snowdon, and Paul Ewbank Jun. 1983 50 p refs

(Contract NAS5-26768)

(NASA-CR-175203; NAS 1.26:175203) Avail: NTIS HC A03/MF A01 CSCL 13B

A network of six sun photometers was placed in the central and northeast United States during the months of July through October, 1931. The objective of the program was to obtain measurements of atmospheric turbidity which can be related to the concentration of visibility-degrading pollutants in the atmosphere. These measurements serve as ground truth for a program to develop remote sensing techniques for measuring the vertically integrated aerosol concentrations in pollution episodes. The sun photometers measure the direct solar radiation in four passbands: 380 nm, 500 nm, 875 nm and 940 nm. The first three passbands will be used for measuring the aerosol optical depth and the last for measuring precipitable water. Author

N84-20029# Geological Survey, Washington, D. C.

EVIDENCE FOR ACID-PRECIPITATION-INDUCED TRENDS IN STREAM CHEMISTRY AT HYDROLOGIC BENCH-MARK STATION

Richard A. Smith and Richard B. Alexander 1983 16 p refs

(USGS-Circ-910) Avail: NTIS HC A02/MF A01

Ten- to 15-year water-quality records from a network of headwater sampling stations show small declines in stream sulfate concentrations at stations in the northeastern quarter of the Nation and small increases in sulfate at most southeastern and western sites. The regional pattern of stream sulfate trends is similar to that reported for trends in SO2 emissions to the atmosphere during the same period. Trends in the ratio of alkalinity to total major cation concentrations at the stations follow an inverse pattern of small increases in the Northeast and small, but widespread decreases elsewhere. The undeveloped nature of the sampled basins and the magnitude and direction of observed changes in relation to SO2 emissions support the hypothesis that the observed patterns in water quality trends reflect regional changes in the rates of acid deposition. Author

N84-20030*# Harvard Univ., Cambridge, Mass. Center for Earth and Planetary Physics.

SOURCES AND SINKS FOR NITROUS OXIDE AND EXPERIMENTAL STUDIES OF THE SOURCE OF ATMOSPHERIC COS, CS-2 AND CH-3-CI

Steven C. Wofsy Mar. 1984 30 p refs Sponsored by NASA

(NASA-CR-175404; NAS 1.26:175404) Avail: NTIS HC A03/MF A01 CSCL 13B

Studies of the air and water chemistry in the Amazon region of Brazil were undertaken. Harvard scientists were invited to participate in several experiments at INPA facilities, at other sites

in Brazil, and aboard the RV Calypso of the Cousteau Society. Expeditions and participants are summarized. Author

N84-20031# Air Force Engineering and Services Center, Tyndall AFB, Fla. Environmental Sciences Branch.
AIRCRAFT GENERATION EQUIPMENT EMISSIONS ESTIMATOR (AGEEE) Final Report, Jul. - Aug. 1983
Glenn D. Seitchek, David D. Berlinrut, and Lisa A. Ramos Nov. 1983 36 p
(AF Proj. 2103)
(AD-A136829; AFESC/ESL-TR-83-48) Avail: NTIS HC A03/MF A01 CSCL 21/2

This report is designed to serve as a handbook for computing emissions from aircraft generation equipment (AGE), both by hand and by using a microcomputer. Emissions factors and the required equations are provided, along with examples which illustrate how to perform the calculations. The techniques described in the report are approximations, and should only be used for estimating emissions. Author (GRA)

N84-20032# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex.
TEMPORAL AND SPATIAL GASEOUS HCl CONCENTRATIONS IN THE NEAR FIELD STS POSTLAUNCH ENVIRONMENT, KENNEDY SPACE CENTER, FLORIDA Final Technical Report, period ending Aug. 1983
W. D. Christensen, J. D. Langwell, and E. S. Barnes Sep. 1983 17 p
(AD-A136935; OEHL-83-298EH374JGA) Avail: NTIS HC A02/MF A01 CSCL 07/2

This report presents the results of hydrochloric acid (HCl) measurements accomplished following the launch of Space Shuttles 5, 6 and 7 from launch complex 39, pad A, at the Kennedy Space Center (KSC). The objective of the sampling program was to evaluate the potential for revolatilization of HCl deposited in the vicinity of the launch complex and to determine the time history of the event if it occurred. The data collected during the program demonstrate that HCl can persist for several hours following Shuttle launch and that there is potential for isolated higher levels of HCl to occur. The data also provide insight to the magnitude of HCl concentration variability which can be influenced by meteorological, topographical and operational parameters. The relative importance of these parameters can be shown to have a major influence on HCl concentrations and will likely be superimposed on any revolatilization or concentration decay curve. The importance of enven low level HCl concetrations on pad reentry personnel is discussed however, the potential effect on electronic equipment and circuitry remains to be addressed. Author (GRA)

N84-20033# Brookhaven National Lab., Upton, N. Y. Process Sciences Div.
AN ANALYSIS OF CONCEPTS FOR CONTROLLING ATMOSPHERIC CARBON DIOXIDE
Meyer Steinberg Dec. 1983 68 p refs
(Contract DE-AC02-76CH-00016)
(DE84-004203; DOE/CH-00016/1) Avail: NTIS HC A04/MF A01

The mitigation of the CO2 effect mainly by controlling the CO2 content in the atmosphere was analyzed. A logic for guiding the construction of the mitigating processes and systems was devised. It is necessary to ascertain the physical, chemical and biological properties required to design the mitigation systems. The criteria for evaluating the process system and scenarios are outlined. Specific process systems for obtaining the mitigating effects are presented and each of the process systems is evaluated. In conjunction with the utilization of CO2, the magnitude of the effect of each of the projected uses on the control of CO2 is determined. DOE

N84-20034# Stahlwerke Peine-Salzgitter A.G. (West Germany).
STUDY OF THE RECOVERY OF VALUABLE METAL STARTING MATERIALS FROM STEELSWORKS SLAG Final Report, Sep. 1982
Uwe Schierloh Bonn Bundesministerium fuer Forschung und Technologie Aug. 1983 96 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-183; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20,50

Techniques for vanadium and chronium enrichment in slags were investigated. The pyrometallurgical approach is technically feasible, but is not cost effective. The hydrometallurgical method that involves alkaline leaching under pressure of ground slag, followed by electrolytic separation of V2O5 and Cr2O3 from the alkaline solution is suitable for basic slag, since it does not affect its commercial value as a fertilizer. Author (ESA)

N84-20035# National Center for Atmospheric Research, Boulder, Colo. Office of Acid Deposition Modeling Project.
REGIONAL ACID DEPOSITION: MODELS AND PHYSICAL PROCESSES
Aug. 1983 399 p refs Sponsored in part by EPA
(Grant NSF 82-17015)
(PB84-115997; NCAR/TN-214/STR) Avail: NTIS HC A17/MF A01 CSCL 04A

This report presents the results of a ten-month study on the current status of research on fundamental concepts and physical processes relevant to regional acid deposition modeling. The role of models in environmental assessment is first described. This is followed by a review of existing models in a chapter designed more to establish a reference framework for the bulk of the report than to provide a comprehensive review. Most, if not all, of the principal concepts in model construction and evaluation are discussed. Extensive discussions of state-of-the-art regional meteorological modeling and the chemistry of acid generation in the troposhere are presented in Chapters 4 and 5. Chapter 6 then focuses on the development of a new generation of acid deposition models. GRA

N84-20036# Oak Ridge Associated Universities, Tenn. Inst. for Energy Analysis.
RELATIONSHIP BETWEEN GLOBAL FOSSIL-FUEL COMSUMPTION AND THE CONCENTRATION OF CARBON DIOXIDE IN THE ATMOSPHERE, PART 1 Final Report, Oct. 1979 - Mar. 1982
Gregg Marland Jun. 1983 133 p refs Sponsored in part by Gas Research Inst.
(PB84-123413; GRI-81/0197) Avail: NTIS HC A07/MF A01 CSCL 04A

A complete review of the historic rate of CO2 discharge to the atmosphere from fossil fuel burning was examined. Considering the rates of fuel production, variability of fuel composition, and variety of fuel uses, we have calculated a time series for CO2 emissions since 1950. The results are consistent with, and hence substantiate earlier estimates that were based on less clear fuel statistics, A mathematical model of the global carbon cycle was developed and documented. Various hypotheses of future fuel use or improved understanding of biospheric or oceanic processes affect our perception of future levels of atmospheric CO2. GRA

N84-20037# National Center for Atmospheric Research, Boulder, Colo. Office for Acid Deposition Modeling Project.
REGIONAL ACID DEPOSITION: DESIGN AND MANAGEMENT PLAN FOR A COMPREHENSIVE MODELING SYSTEM
Aug. 1983 43 p refs Sponsored in part by EPA
(Grant NSF-82-17015)
(PB84-116003; NCAR-TN-215; NCAR-ADMP-83-2) Avail: NTIS HC A03/MF A01 CSCL 04A

This is a companion report to Regional Acid Deposition: Models and Physical Processes. This report presents a design and management plan for the development of a Eulerian regional acid deposition model. It first reviews the fundamental physical processes relevant to regional acid deposition and then describes the proposed model system. The principal components (meteorology and chemistry) are discussed in some detail with special

emphasis on model initialization and subsystem validation. The total system integration and full validation are presented separately. The management plan section focuses on internal structure, external interaction, and special facility needs. Strongly managed interdisciplinary interactions and intensive hand-on working groups for external interactions are suggested. GRA

N84-20038# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Sciences Research Lab.
EPA (ENVIRONMENTAL PROTECTION AGENCY) MODEL DEVELOPMENT FOR STABLE PLUME IMPINGEMENT ON ELEVATED TERRAIN OBSTACLES Interim Report, Jun. 1980 - Jun. 1983
Francis A. Schiermeier, Thomas F. Lavery, David G. Strimaitis, Akula Venkatram, Benjamin R. Greene, and Bruce A. Egan 1983 15 p refs Prepared in cooperation with Environmental Research and Technology, Inc., Concord, Mass.
(PB84-130491; EPA-600/D-82-026) Avail: NTIS HC A02/MF A01 CSCL 13B

The U.S. Environmental Protection Agency's Complex Terrain Model Development program is designed as a series of progressively advanced model development efforts accompanied by requisite field studies to provide data for model evaluation. Plume impingement studies have been performed during 1980 at Cinder Cone Butte near Boise, Idaho, and during 1982 at Hogback Ridge near Farmington, New Mexico. Experimental protocol consisted of terrain-surface measurements of dual-tracer plumes emitted from mobile cranes during stable atmospheric conditions. Author (GRA)

N84-20039# Wyoming Univ., Laramie.
ACID PRECIPITATION IN SOUTHEASTERN WYOMING
J. Ahern and C. Baird Sep. 1983 105 p refs
(Contract DI-14-34-0001-1154)
(PB84-132521; W84-00639; OWRT-A-032-WYO(1)) Avail: NTIS HC A06/MF A01 CSCL 07D

Snowfall, snowpack, and rainfall samples were collected in Laramie, Wyoming and in the Snowy Range west of Laramie from March to June 1981 to determine the occurrence and sources of acid precipitation in southeast Wyoming. Electrodes measured different pH values in the samples; however, fast-response electrodes yielded higher and apparently more accurate pH measurements. The pH values in the Laramie precipitation and snowpack were typically greater than 5.0, but all the Snowy Range snowpack pH values were less than 5.0. The lower pH values in the Snowy Range snowpack were caused by higher concentrations of the acid-forming nitrate and lower concentrations of the neutralizing calcium. Since there are few local sources of acidity, acid ions probability traveled long distances from their origins. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-20040# Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Atmospheric Research.
REFINEMENTS TO A ONE-DIMENSIONAL CARBON CYCLE MODEL
I. G. Enting and G. I. Pearman 1983 40 p refs
(ISBN-0-643-03582-6; CSIRO-TP-3/1-35(1983)) Avail: NTIS HC A03/MF A01

Carbon-13 in fossil fuel, generalized forest cleaning functions, biospheric exchanges, ocean advection, detrital flux, preindustrial CO2 concentration in the atmosphere, atmosphere-ocean fractionation factors, ocean-surface alkalinity, friction velocities, ocean surface temperature, ocean mixing parameters, detrital rainout, mixed layer depth, parameterizing the biosphere, forest clearing, Carbon-13 fractionation factor for the terrestrial biosphere, Carbon-14 production, ocean carbonate concentrations, and Suess effect data are provided. N.W.

N84-20041*# Johns Hopkins Univ., Baltimore, Md.
THE MAGNETIC PETROLOGY OF THE DEEP CRUST AND THE INTERPRETATION OF REGIONAL MAGNETIC ANOMALIES Ph.D. Thesis
Charles Martin Schlinger 1983 254 p refs
(NASA-CR-175407; NAS 1.26:175407) Copyright. Avail: Issuing Activity CSCL 04A

Rocks from Lofoten and Vesteraalen, Northern Norway, a high-grade province of deep seated origin with associated regional magnetic and gravity anomalies are studied. These rocks have a bulk magnetic character of surprising uniformity, with susceptibilities, hysteresis, and Curie temperatures, defined solely by nearly pure magnetite. Stable remanence is observed only in samples from SW Lofoten and is never of significant magnitude. The carrier of this remanence invariably appears to be hematite with 5 to 10 mole percent ilmentite in solution. Contrary to speculation the thermal enhancement of magnetic susceptibility, the Hopkinson effect, is not important in type lithologies. Rocks from the deepest part of the section have the largest average susceptibilities, .005 (c.g.s. Gaussian units), and magnitudes of nrm (natural remanent magnetization), .0004 emu/g. Author

N84-20042*# Visidyne, Inc., Burlington, Mass.
SMM-UVSP OZONE PROFILE INVERSION PROGRAMS Final Report
H. J. P. Smith Sep. 1983 74 p refs
(Contract NAS5-26086)
(NASA-CR-175216; NAS 1.26:175216; VI-697) Avail: NTIS HC A04/MF A01 CSCL 04A

The documentation and user manual for the software used to invert the UVSP aeronomy data taken by the SMM are provided. The programs are described together with their interfaces and what inputs are required from the user. Author

N84-20043*# National Aeronautics and Space Administration, Washington, D. C.
THE ELEMENTS OF THE EARTH'S MAGNETISM AND THEIR SECULAR CHANGES BETWEEN 1550 AND 1915
H. Fritsche Mar. 1983 75 p Transl. into ENGLISH from the book "Die Elemente Des Erdmagnetismus und ihre Saecularen Aenderungen Wahrend des Zeitraumes 1550 bis 1915" St. Petersburg, Russia, A. Yakobson, 1900 p 1-62 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77343; NAS 1.15:77343) Avail: NTIS HC A04/MF A01 CSCL 08N

The results of an investigation about the magnetic agents outside the Earth's surface as well as the Earth's magnetic elements for the epochs 1550, 1900, 1915 are presented. The secular changes of the Earth's magnetic elements during the time interval 1550 - 1900 are also included. S.L.

N84-20044# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
SATELLITE MEASUREMENTS OF RADIATION BUDGETS Final Report, Feb. 1983
Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 159 p refs Presented at 2nd Symp. on Meas. of the Radiation of the Earth, Cologne, 9-10 Dec. 1982 Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-83-025; ISSN-0170-1339) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32,50

Determination of the radiation budget parameters at the top of the atmosphere and on the ground; sampling problems, including sources; conical scan radiometers; measurement of optical data of aerosols in the atmosphere; the interactions of clouds and radiation; and comparison between radiation budget components derived from climate modeling and satellite measure-

ments are discussed. For individual titles, see N84-20045 through N84-20065.

N84-20045# Cologne Univ. (West Germany).
SAMPLING PROBLEMS OF SATELLITE MEASUREMENTS OF RADIATION BUDGET PARAMETERS
Ehrhard Raschke *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 14-19 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

Sampling errors in satellite measurements of planetary emission and albedo to space are reviewed. Spectral and field of view (FOV) limitations, angular dependence of radiances from the same scene, and time and space coverage of radiation fields are discussed. Scanning radiometers with narrow FOV, and non-scanning radiometers with wide FOV are considered. Although errors can be investigated by numerical simulation, no overall strategy is available. Author (ESA)

N84-20046# Cologne Univ. (West Germany).
ANGULAR CORRECTIONS OF SATELLITE DERIVED MEASUREMENTS OF RADIANCES
M. Wiegner *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 20-25 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

The dependence of the anisotropy factor on the state of the atmosphere and on the observation geometry is determined empirically using data from satellite measurements and with radiation transfer model calculations. With Nimbus 7 measurements, the short wave anisotropy factor was estimated for different scenes. For desert surfaces the calculations fail to describe the experimental results. Because the anisotropy of reflected short wave radiation at the top of the atmosphere is a combined effect of the surface (scene) and the atmosphere, improvement is possible only if the reflection properties of the underlying surface can be simulated correctly. Author (ESA)

N84-20047# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
ERROR ANALYSIS OF SATELLITE DERIVED RADIATION FLUX DENSITIES
Rolf Stuhlmann *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 26-32 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

A method to calculate the error bars of satellite radiation flux densities is outlined. The inversion functions, and a method to choose the right values of these functions, depending on the measured signal, are specified. Two dimensional fields of radiation flux densities, which enable the radiation measuring process to be simulated, are defined. The inversion functions are applied to the simulated measurements, and the retrieved radiation flux densities are compared with the original two dimensional field of radiation flux densities. Author (ESA)

N84-20048# Centre National de la Recherche Scientifique, Paris (France).
SAMPLING PROBLEMS AND CLOUD STATISTICS
Michel Desbois and G. Seze *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 33-37 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

A cloud classification algorithm used to investigate problems of satellite imagery sampling and to derive cloud statistics from Meteosat and GOES EAST data is described. The dynamic cluster method is applied to histograms composed by pixels of a chosen area, which constitute the learning set. The number of classes extracted by the algorithm; the kernels of the classes; a value in each channel and their variances; and the percentage of points in each class of the learning set are obtained. Each point of the image is attributed to a class according to the definition used in the first stage of the distance to a class in the histogram space: Euclidian distance to the kernel of a class + variance of the class. Output is the percentage of points in each class of the image, and classified images. Physical interpretation of classes found in terms of optical and radiative properties of the clouds is required. Author (ESA)

N84-20049# European Space Operations Center, Darmstadt (West Germany).
RADIATION BUDGET PARAMETERS FROM METEOSAT-2 DATA
Marianne Gube *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 38-43 refs Sponsored by ESA (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

A 3 month Meteosat data set was used to investigate monthly and diurnal change patterns of the radiation budget components at the top of the atmosphere. The anisotropic radiance distribution was derived from results of radiative transfer models so that the actual satellite measured radiance is corrected with respect to anisotropy. Thus the derived radiation budget parameters reflect real short-term changes rather than changes resulting from a differing Sun-satellite point of observation geometry. Results are only valid for Meteosat field of view. The radiation budget components are strongly influenced by large desert and ocean areas. Author (ESA)

N84-20050# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
A CONICAL SCAN RADIOMETER FOR AN AIRPLANE MISSION c35
Theo Prosch, Detlef Hennings, Wen-Hwa Lin, and Ehrhard Raschke *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 44-52 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

An aircraft-borne radiometer to complement satellite radiometer observations is proposed. Performance is studied using systems theory. The instrument provides in situ ground truth, optimizes satellite sampling properties, and analyzes radiation in a given area by temporal sampling. Subsystems include a Herschel telescope mounted on a spinning optical bench; a detector system composed of filters, pyroelectrical sensors in the focal plane, reference blackbodies and a chopper wheel; signal processing electronics to amplify filter and digitize sensor signals; control and housekeeping electronics; calibration system consisting of temperature stabilized blackbodies and light sources with related diffusors; and data gathering system with on-line data check capability. Author (ESA)

N84-20051# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
ON THE USE OF NARROW BAND INFRARED CHANNELS TO DETERMINE THE OUTGOING LONG WAVE FLUX c35
Petra Landsberg and J. Schmetz *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 53-59 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

Narrow band channels of a satellite-borne conical scanning radiometer which are useful to determine the broad band outgoing long wave radiance at the top of the atmosphere were studied. It is found that a high correlation exists between the broad band radiance and the narrow band radiances in the window region and in 6.3 micron water vapor band. Inclusion of the 15 micrometer CO2 band does not improve the correlation. Author (ESA)

N84-20052# Technische Univ., Hanover (West Germany). Inst. fuer Meteorologie und Klimatologie.
ALBEDO OF THE SAHARA
G. Tetzlaff *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 60-63 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

Ground and airborne measurements of the albedo of the Sahara desert are summarized. Large sand surfaces show albedo

values > 40% in airborne measurements, for volcanic, mountainous regions it is > 30%. Ground measurements give values between 47% and 49% for sand. Comparison of plant coverage, albedo, and surface type gives average Saharan albedo = 32%; considering only bare surfaces, the albedo is 36%. For the last glaciation period average albedo is estimated at 38%. For the more humid period 5500yr ago, it is 27%. Author (ESA)

N84-20053# Technische Univ., Munich (West Germany). Inst. fuer Meteorologie.

FUNDAMENTAL APPROACHES FOR DETERMINING THE RADIATION BUDGET (AND CORRESPONDING ACTIVITIES AT METEOROLOGISCHES INSTITUT, MUNICH (MIM) AND INSTITUT FUER PHYSIK DER ATMOSPHAERE (IPA))

H. Quenzel, Peter Koepke, and K. T. Kriebel (DFVLR, Oberpfaffenhofen, West Germany) *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 64-71 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

Radiation budget determination from a good knowledge of the actual stete of the atmosphere and the Earth surface, using radiative computations (parameter method); determination from upward radiances above the atmosphere in one or only a few directions and in small spectral bands in the solar and terrestrial spectral regions (conversion method); and determination from upward radiances above the atmosphere in many directions (or from upward radiant flux densities above the atmosphere) and in broad spectral bands covering the whole solar and terrestrial spectral regions as well as possible (collecting method) are compared. No method yields radiant flux densities from measurements only, without radiative transfer calculations. Author (ESA)

N84-20054# Technische Univ., Munich (West Germany). Inst. fuer Meteorologie.

THE SHORTWAVE RADIATION BUDGET DEPENDING ON THE OPTICAL PARAMETERS OF THE ATMOSPHERE

Bernd Dietrich *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 72-78 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

Starting with a given inaccuracy of the radiation budget to be determined, the necessary accuracy of optical parameters is analyzed for a cloudfree atmosphere in the short wave spectral range. Analysis shows that inaccuracy depends mainly on the anisotropic reflection function. Water vapor and ozone have nearly no influence; turbidity and aerosol absorption have only a small influence. It is sufficient to determine the surface reflection properties and, less significant, the aerosol properties to get the short wave radiation budget with sufficient accuracy via the parameter method. Author (ESA)

N84-20055# Technische Univ., Munich (West Germany). Inst. fuer Meteorologie.

ACCURACY OF THE SHORT WAVE RADIATION BUDGET DERIVED FROM METEOSAT-VIS-DATA

Peter Koepke *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 79-84 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

Anisotropic reflection functions of vegetated surfaces are used to determine the resulting uncertainty in the radiant flux density in the solar spectral range (MSOL) converted from Meteosat-VIS-data. Results show that this uncertainty is up to 15%. The uncertainty in MSOL due to digitization plus calibration of the Meteosat VIS channel is 8%. Author (ESA)

N84-20056# Kiel Univ. (West Germany). Abteilung Maritime Meteorologie.

LONG WAVE RADIANCE TO SPACE AND NET FLUX AT THE SURFACE

Hartmut Grassl and Ralf Meerkoetter *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 85-94 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

Calculation of net long wave fluxes at the top of the atmosphere from one of a few spectral radiance values at one or a few viewing angles; and estimation of surface long wave net flux from satellite data are discussed. The spectral composition of long wave net flux (F net) profiles and net flux at the top of the atmosphere; radiances in the same spectral intervals depending on zenith angle; and the variation of a number of radiances as a function of surface longwave net flux are computed. The radiances and fluxes are calculated for a variety of atmospheres, containing clouds at different altitudes. Results show that mean tropospheric temperature determines upwelling radiance for a window interval, while water vapor content dominates F net, leading to an ambiguity which grows with mean temperature. Author (ESA)

N84-20057# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.

AEROSOL DETECTION BY POLARIZATION MEASUREMENTS

Detlef Hennings and Wen-Hwa Lin *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 95-100 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

The influence of atmospheric aerosol on the degree of polarization of scattered solar radiation is investigated by a single scattering approximation and by a complete solution of the equation of radiative transfer, including a rough sea surface. Both models indicate that the inverse degree of linear polarization is approximately a linear function of the aerosol optical thickness, at selected observation angles. Comparison shows that multiple scattering must be considered to get quantitatively correct results. Author (ESA)

N84-20058# Bonn Univ. (West Germany). Inst. fuer Meteorologie.

RADIATION FOR BOX BUDGETS

Dieter Klaes, Michael Hantel, and Eberhard Schaller *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 106-113 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

In order to incorporate radiative heating and cooling effects in diagnostic energy budgets, a two-stream model for the European area which includes a parameterization of fractional cloud cover was designed. Energy budgets are calculated for each of 16 atmospheric columns of equal basis area (36,000 sqkm). Each column is divided into 4 layers of 250 hPa, making 64 atmospheric boxes of equal mass. Input data is synoptic temperature and humidity, objectively analyzed on isentropic surfaces (grid size 63.5 km). Results show that overall error in single terms of the energy budgets is < 10W/sqm. Author (ESA)

N84-20059# Cologne Univ. (West Germany).

VERIFICATION OF THE RADIATION BUDGET IN NUMERICAL MODELS

H. Preuss and Paul Muellenmeister *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 114-122 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

Radiation fluxes calculated by a model using three different radiation schemes are compared with values derived from simultaneous measurements of TIROS-N and Nimbus-7. Zonal averages of 10-day means of the planetary radiation budget and its components are considered. Albedo agrees within 10%, but large differences occur for cloud cover in the intertropical convergence zone. Comparison of two models shows significant weaknesses of cloud estimates. Author (ESA)

N84-20060# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.

RADIATION AND CLOUDS, THE INTERNATIONAL SATELLITE CLOUD CLIMATOLOGY PROJECT (ISCCP) c47

E. Ruprecht, C. Simmer, and S. Brandt *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 123-126 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

The International Satellite Cloud Climatology Project (ISCCP) to exploit global coverage by geostationary and polar orbiting meteorological satellites to provide a 5yr Global Cloud Climatology (GCC) is introduced, and cloud analysis algorithms are discussed. The GCC includes information on global distribution of total cloudiness; distribution of cloud types and their heights; diurnal, seasonal and annual variability of clouds; and cloud radiative properties. This is achieved by evaluating total cloud amount; amount and top height of low, middle high, high and convective cloudiness; radiation temperature and albedo of surface and cloud types; and cloud size distribution. Each parameter is evaluated every 3 hr for 2.5 x 2.5 deg boxes. Monthly mean is computed.
Author (ESA)

N84-20061# Lille Univ. (France). Lab. d'Optique Atmospherique.

THE NEPHOS PROGRAM: PRELIMINARY RESULTS c47

B. Bonnel, J. C. Buriez, Yves Fouquart, and J. J. Morcrette *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 127-131 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

The NEPHOS file of satellite data on cloudiness and related large scale fields of temperature, humidity and winds is presented. Observed and predicted cloudiness are compared. Validation of a long wave radiative transfer model is described. The file contains the geopotential height, temperature, specific humidity, and three components of the wind for pressure levels from 50 to 1000 mb; surface geopotential height, pressure, temperature, humidity, snow depth; cloudiness; horizontal components of the wind at 10 m; temperature and dew point temperature at 2 m; precipitation integrated over the last 12 hr; frictional dissipation in the planetary boundary layer; latent and sensible heat fluxes; and net radiative fluxes at the surface and the top of the atmosphere.
Author (ESA)

N84-20062# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.

ON THE DERIVATION OF CLOUD STRUCTURE PARAMETERS FROM AIRCRAFT MEASUREMENTS c47

J. Schmetz and Frank-Juergen Diekmann *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 132-137 (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

Cloud cover, cloud height and spatial distribution were derived from radiation measurements with aircraft. The consistency of the parameters derived from different radiation sensors was checked. Results show that the derived parameters can be used as ground truth for a cloud structure analysis from satellite. Author (ESA)

N84-20063# Academia Sinica, Lanzhou (China). Inst. of Plateau Atmospheric Physics.

ESTIMATION OF PLANETARY ALBEDO AND EMISSION OVER THE TIBETAN PLATEAU FROM AVHRR DATA

Zhong Qiang *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 138-142 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

A method of estimating planetary albedo and outgoing long wave flux from TIROS-N AVHRR data is described. Albedo is derived by correction for anisotropy and the integration over all angles for channels 1 and 2 to obtain filtered albedoes. This is estimated by an empirical anisotropy scattering function. Filtered albedo is converted to total albedo. Results confirm that albedo patterns depend on cloud distribution and the nature of the underlying surface. Approximations and uncertainties, such as the use of gross experimental anisotropic factors and the regression equations derived from model calculations, can bias results.
Author (ESA)

N84-20064# Schweizerische Meteorologische Zentralanstalt, Zurich.

PROSPECTIVE USE OF A MOBILE RADIATION SYSTEM TO VALIDATE TECHNIQUES OF RADIATION ESTIMATIONS FROM SATELLITE RECORDS

A. Heimo, J. Ruchti (Eidgenoessische Technische Hocschule), and A. Zelenka *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 143-152 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

A mobile radiation measurement system was used for spectral measurements of direct and diffuse radiation. Daily and hourly sums of horizontal global radiation were calculated. A model for correlating satellite measurements with terrestrial radiation measurements was developed. Results show that the estimation is feasible, but the model should be refined. Author (ESA)

N84-20065# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.

MAPPING OF GLOBAL RADIATION FROM METEOSAT IMAGE DATA

Werner Moeser *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 153-159 refs (For primary document see N84-20044 10-46)

Avail: NTIS HC A08/MF A01

An operational method to determine the field of global radiation at the surface from Meteosat imagery was developed. Daily sums of global radiation measured by 19 pyranometers were compared with the results derived from Meteosat data of the same period. The RMS difference for daily sums (using up to 6 satellite images per day) reaches 0.56 kWh/sqm, which is 7% of the corresponding daily sum under clear sky conditions. Maps of global radiation were derived for Europe, the Mediterranean Sea and North Africa. Author (ESA)

N84-20066# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.

PREDICTION OF TOTAL ELECTRON CONTENT USING THE INTERNATIONAL REFERENCE IONOSPHERE Final Technical Report

Leo F. McNamara 20 Sep. 1983 43 p

(AF Proj. 4643)

(AD-A137136; AFGL-TR-83-0239; AFGL-ERP-853) Avail: NTIS HC A03/MF A01 CSCL 04/1

The International Reference Ionosphere (IRI) is a model of the ionosphere, based on experimental data, that has been proposed as a standard ionospheric model. As such, it should be tested extensively to determine its range of validity. One of the ways in which the electron density profile given by the IRI, especially above the peak of the F layer, can be tested is to compare calculated and observed values of total electron content (TEC). We have therefore studied the discrepancies between calculated and observed values of TEC recorded at 15 stations covering a wide range of longitudes and latitudes mainly in the Northern Hemisphere, and mainly for high levels of solar activity. We have found that the IRI produces reasonably accurate values of TEC at mid- and high-latitudes, but that if greatly underestimates the daytime values of TEC at low latitudes. We conclude therefore that the daytime electron density profile given by the IRI is reasonably accurate at mid- and high-latitudes; at least above the peak of the F2 layer. The situation at low latitudes clearly requires more work, and we have suggested two possible lines of study. The generally low discrepancies at night indicate that the nighttime electron density profiles given by the IRI correspond fairly closely to the actual profiles. Author (GRA)

N84-20067# Epsilon Labs., Inc., Burlington, Mass.

A MOLECULAR IDENTIFICATION DEVICE FOR INDIVIDUAL SUB-MICRON AEROSOLS: ENGINEERING BREADBOARD DEVICE Final Report, 15 Sep. 1980 - 1 Aug. 1983

Henry A. Miranda, Jr. Aug. 1983 15 p

(Contract F19628-80-C-0211; AF Proj. 6687)

(AD-A137139; AFGL-TR-83-0234) Avail: NTIS HC A02/MF A01 CSCL 04/1

Progress on the second phase development effort of an

instrument for determining both the size and the chemical composition of individual submicron particulates, is reported. A description of improvements incorporated in the engineering breadboard following recommendation issuing from the first phase effort, together with a very preliminary set of specifications for a flight prototype instrument, are included. Also included is a brief discussion on the corollary question of the size distribution prevalent in the stratosphere, and its relation to design aspects of the instrument. GRA

N84-20068# Cornell Univ., Ithaca, N.Y. Lab. of Plasma Studies.
UNIFIED THEORY OF THE POWER SPECTRUM OF LONG WAVELENGTH IONOSPHERIC ELECTRON DENSITY IRREGULARITIES Interim Report
R. N. Sudan and M. J. Keskinen 9 Jan. 1984 27 p
(S99-QMXB)
(AD-A137356; NRL-MR-5234) Avail: NTIS HC A03/MF A01 CSCL 04/1

An extension of the Kolmogorov theory of fluid turbulence is used to develop a unified treatment of the power spectrum of long wavelength electron density structures and irregularities in the equatorial and high latitude ionosphere. Favorable comparison is made among theory, experimental observations, and numerical simulations. Author (GRA)

N84-20069# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
THE PLASMA SHEET BOUNDARY LAYER Scientific Report, 1978 - 1979
T. E. Eastman, L. A. Frank, W. K. Peterson, and W. Lennartsson Mar. 1983 60 p Submitted for publication Prepared in cooperation with LMSC, Palo Alto, Calif.
(Contract N00014-76-C-0016)
(AD-A137399; U-OF-IOWA-83-5) Avail: NTIS HC A04/MF A01 CSCL 04/1

The plasma-sheet boundary layer is a temporally variable transition region located between the magnetotail lobes and the central plasma sheet. We have made a survey of these regions using particle spectra and three-dimensional velocity-space distributions sampled by the ISEE-1 LEPEDEA. Ion composition measurements obtained by the Lockheed ion mass spectrometers indicate that ionospheric ions play a crucial role in magnetotail dynamics. Eleven crossings from the lobes to the central plasma sheet taken at various local times and levels of geomagnetic activity are analyzed in detail. The average ratios of He(+)/H(+), He(++)/H(+) and 0(+)/H(+) are not significantly different between the plasma-sheet boundary layer and central plasma sheet. Intense antisunward-flowing beams of ionospheric origin at E/q of < 1 kV are often seen in the tail lobes, the plasma-sheet boundary layer and, infrequently, in the central plasma sheet. Such beams are not commonly observed in the central plasma sheet which is characterized by hotter and more isotropic ion and electron distributions. Our samples of ion distributions in the plasma-sheet boundary layer frequently show an evolution of distribution functions from highly anisotropic single beams or counter-streaming beams towards the more isotropic distributions typical of the hot component of the central plasma sheet. Provided that the acceleration process for these beams can be identified, we can then account for the transport and injection of hot plasma into the central plasma sheet. We conclude that the plasma-sheet boundary layer is a primary transport region of the magnetotail. GRA

N84-20070# Los Alamos Scientific Lab., N. Mex.
PLASMA SHEET BEHAVIOR DURING SUBSTORMS
E. W. Hones, Jr. 1983 30 p refs Presented at Chapman Conf. on Magnetic Reconnection, Los Alamos, N. Mex., 3 Oct. 1983
(Contract W-7405-eng-36)
(DE84-003833; LA-UR-83-3361) Avail: NTIS HC A03/MF A01

Auroral or magnetic substorms which are periods of enhanced auroral and geomagnetic activity lasting one to a few hours that signify increased dissipation of energy from the magnetosphere to the Earth are discussed. Data acquired during the past decade from satellites in the near Earth sector of the magnetotail suggested that during a substorm part of the plasma sheet is severed from Earth by magnetic reconnection, forming a plasmoid, i.e., a body of plasma and closed magnetic loops, that flows out of the tail into the solar wind, thus returning plasma and energy that were earlier accumulated from the solar wind. This picture was confirmed by observations, with the ISEE 3 spacecraft in the magnetotail 220 R/sub E/ from Earth, of plasmoids passing that location in clear delayed response to substorms. It appears that plasmoid release is a fundamental process whereby the magnetosphere gives up excess stored energy and plasma and that the phenomena of the substorm seen at Earth are a by product of the fundamental process. DOE

N84-20071# Los Alamos Scientific Lab., N. Mex.
IMPLICATIONS OF THE 1100 UT 22 MARCH, 1979 CDAW 6 SUBSTORM EVENT FOR THE ROLE OF MAGNETIC RECONNECTION IN THE GEOMAGNETIC TAIL
T. A. Fritz, D. N. Baker, R. L. McPherron, and W. Lennartsson 1983 18 p refs Presented at Chapman Conf. on Magnetic Reconnection, Los Alamos, N. Mex., 3 Oct. 1983
(DE84-004335; LA-UR-83-3498; CONF-8310229-1) Avail: NTIS HC A02/MF A01

Energetic electron and magnetic field measurements from a set of four satellites aligned from 6.6 to 13 R/sub E/ at the 0200 LT meridian at the time of the magnetospheric substorm event of 1100 UT are presented. These data show that a magnetic X-line formed spontaneously in the vicinity of 7 R/sub E/ in response to a steady buildup of magnetic stress in the geomagnetic tail. DOE

N84-20072# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
GLOBAL TEMPERATURE PATTERNS 6000 YEARS AGO Progress Report
Thompson Webb, III Dec. 1983 18 p refs
(Contract DE-AC02-79EV-10097)
(DE84-004109; DOE/EV-10097/5) Avail: NTIS HC A02/MF A01

A computer tape with the global set of paleoclimatic data for 6000 yr B.P. and contour maps of this information was prepared. Data for pollen, lake level, and marine plankton were compiled. Some new data from Alaska, eastern North America, South America, and the Indian Ocean were added to the data set. Maps that show temperature estimates for 6000 yr B.P. from over 200 sites in eastern North America and from over 250 sites in Europe are included. Patterns are evident on these maps, and certain regions, e.g., the Mediterranean and the eastern Canadian Arctic, may have had cooler temperatures at 6000 yr B.P. than today. DOE

N84-20073# Prakla-Seismos G.m.b.H., Hannover (West Germany).
COMBINED SWEEPS FOR SEISMIC REFLECTION SURVEYS USING THE VIBROSEIS SYSTEM Final Report, Dec. 1981
Hans Werner Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 82 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und technologie
(BMFT-FB-T-83-211; . ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,50

Combined VIBROSEIS sweeps using amplitude spectrum shaping and encoded sweeps based on short sweeps composed to signal sequences were investigated. Research results are satisfactory. Signal combination by common depth point method is mentioned. Author (ESA)

N84-20074# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
CATALOG OF SEISMOGRAM ARCHIVES (REVISED)
Dale P. Glover and Wilbur A. Rinehart 1983 47 p refs
(PB84-127976; KGRD-9; NOAA-83120502) Avail: NTIS HC A03/MF A01 CSCL 08K

This catalog describes the seismograph networks and the

instruments that produce the seismograms in NGDC's archieve; it also lists the recording stations and dates for which seismograms are available. The archived records include those from the Worldwide Standard Seismograph Network (WWSS), the Global Digital Seismograph Network (GDSN), the Canadian Seismograph Network (CSN), and the People's Republic of China Network (PRC). The tabular lists in the catalog provide a quick and comprehensive review of the records now available as well as the names of the stations that produced them. GRA

N84-20075# New York Sea Grant Inst., Albany.
GREAT LAKES COASTAL GEOLOGY: STRATIGRAPHY AND BLUFF RECESSION ALONG THE LAKE ERIE COAST, NEW YORK
Richard J. Geier (State Univ. of New York) and Parker E. Calkin (State Univ. of New York) 1983 63 p refs
(Grant NA81AA-D-00027)
(PB84-128933; NOAA-83120902) Avail: NTIS HC A04/MF A01 CSCL 08M

Severe erosion along the Lake Erie coast and general flooding in other parts of the New York State have led to proposals for shoreline stabilization or lake level control programs. This study was undertaken to supply some of the data needed by management for decisions concerning such stabilization or alternative conservation measures. The short-term (1938-1974) and long-term (1875-1974) bluff recession rates along the New York Lake Erie coast were measured at 116 locations between Buffalo and the Pensylvania state line. Author (GRA)

N84-20076# United Technologies Corp., South Windsor, Conn. Power Systems Div.
ON-SITE FUEL CELL POWER PLANT TECHNOLOGY DEVELOPMENT PROGRAM Annual Report, Jan. 1982 - Jan. 1983
1983 157 p refs
(PB84-125095; FCR-4991A; GRI-82/0099) Avail: NTIS HC A08/MF A01 CSCL 08N

The 1982 field data were found to be consistent with the product requirement market model discussed in 1981. Subscale electrode tests with advanced catalysts approach the program performance goal. Cell coolers were defined which reduced the number of coolers required per stack by 60% and the cost of a cooler array by 65%. An acid condensation cell design was defined which is expected to double the interval between acid refills. A low pressure drop tubular reformer design was projected to be significantly less expensive than the scale-up of the 40-kW configuration. Work on the sulfur-tolerant reformer was terminated because this type of reformer provides no cost advantage given available catalyst performance. Feasibility of an individual commutation circuit inverter was demonstrated. GRA

N84-20077# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
PROCEEDINGS OF AEROMAGNETIC DATA WORKSHOP
David M. Clark, ed. and Jerry L. Coffman, ed. Oct. 1983 70 p Workshop held in Boulder, Colo., 16-18 Nov. 1982
(PB84-127125; WORKSHOP-PROCEEDINGS-1) Avail: NTIS HC A04/MF A01 CSCL 08N

Partial contents: Aeromagnetic data at the National Geophysical data Center; Project Magnet - vector data-processing and data base formats; Requirements of marine aeromagnetic data for geological applications; an overview of the geological applications of digital data bases; requirements for a national data base; toward a national magnetic anomaly data base; the 1981 revision of the international geomagnetic reference field; aeromagnetic processing techniques at the Kansas Geological Survey. GRA

N84-20078# Stanford Univ., Calif.
CLASSIFICATION OF THE CALIFORNIA DESERT FOR GEOLOGY-ENERGY-MINERAL RESOURCE POTENTIAL GEOSTATISTICAL CLASSIFICATION
F. W. Lambie (TERRADATA, San Francisco, Calif.), J. W. Harbaugh, G. R. Kendall (TERRADATA, San Francisco, Calif.), and J. D. Juilland (Bureau of Land Management) May 1983 183 p refs
(Contract DI-YA512-CT9-66)
(PB84-100668; BLM-YA-PT-83-002-4335; BLM/TN-359) Avail: NTIS HC A09/MF A01 CSCL 08G

Lands in the California Desert (over 100,000 square kilometers) were classified according to their potential for geology, energy, and mineral (GEM) resources. Several methods were used. Technical Note 359 presents the method which used geo-statistical techniques. All available data on GEM resources were collected, including 3146 mineral occurrences. Eighty variables, lithologic, structural, lineament, tonal, and geochemical, were identified and recorded on a cell-by-cell basis. Data were encoded in numerical form for 26,810 cells, each 2 km by 2 km. Data recorded in this fashion plus the data on GEM occurrences served as the basis for statistically classifying cells according to the likelihood of mineral occurrence. Discriminat function analysis (DFA) is the statistical method used. Author (GRA)

N84-20079 Nebraska Univ., Lincoln.
TURBULENT EXCHANGE OF CARBON DIOXIDE, WATER VAPOR, HEAT AND MOMENTUM OVER CROP SURFACES Ph.D. Thesis
Dean Edgar Anderson 1983 203 p
Avail: Univ. Microfilms Order No. DA8328153

Turbulence was measured over soybean and sorghum crops. Measurements were made with a prototype, fast response CO2 sensor employing infrared beam absorption techniques, a Lyman-alpha hydrometer, fine wire thermocouples, and with drag and one dimensional vertical sonic anemometers. Calibration and operational procedures were developed for the use of the CO2 sensor in the field. Daytime and nocturnal CO2 fluxes measured over soybeans and sorghum were found to be consistent with profile and chamber measurement results. On a clear day with moderate temperatures and wind speeds, peak CO2 flux rates over well water soybeans (leaf area index, LAI approximately 4.0) ranged around 1.0 mg sq m (ground area) s sub 1 when flux density of photosynthetically active radiation was about 1,750 micro Ei sq m. Dissert. Abstr.

N84-20080 Washington Univ., Seattle.
THE VERTICAL PROPAGATION OF INTERNAL GRAVITY WAVES IN A COMPRESSIBLE ATMOSPHERE Ph.D. Thesis
Lawrence Coy 1983 205 p
Avail: Univ. Microfilms Order No. DA8326863

The vertical transfer of momentum by internal gravity waves in a compressible atmosphere is studied using two models: the integration of the two dimensional hydrostatic gravity wave equations (referred to as the explicit gravity model), and a model based on a slowly varying approximation of the gravity wave equations. In both models the waves can force changes in the mean flow and the waves can respond to these mean flow changes. Some properties of the slowly varying model are investigated using the method of characteristics; it is found that an isolated disturbance will tend to split in two. Numerical solutions of the slowly varying model show that, for a switch-on wave source at a lower boundary, a strong shear forms in the mean wind and descends with time. Because of the decrease in density with height, large mean flow changes can occur at upper levels. The phase speed of the wave is also shown to increase at upper levels in response to the time changing mean flow. Dissert. Abstr.

N84-19948 Bayerische Akademie der Wissenschaften, Munich (West Germany).
GRAVIMETRY
Wolfgang Torge *In its* Natl. Rept. of Federal Republic of Germany on Geodetic Activities, 1979 - 1983 1983 p 128-139 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

N84-19952 Bayerische Akademie der Wissenschaften, Munich (West Germany).
RECENT CRUSTAL MOVEMENTS
Hermann Maelzer *In its* Natl. Rept. of Federal Republic of Germany

on Geodetic Activities, 1979 - 1983 1983 p 231-251 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-20081 Royal Netherlands Meteorological Inst., De Bilt. Fysisch Meteorologisch Onderzoek.
REVIEW OF PUBLICATIONS ON THE DUTCH WIND CLIMATE [OVERZICHT VAN PUBLIKATIES OVER HET NEDERLANDS WINDKLIMAAT]
J. Wieringa Sep. 1983 21 p refs In DUTCH
(KNMI-TR-41(FM)) Avail: Issuing Activity

An annotated bibliography containing about 400 items concerning the wind climate in the Netherlands and published between 1950 and 1983 is presented. Publications concerning wind measurement, instruments, wind stations, analysis of station measurements, and related subjects are included. Author (ESA)

N84-20082# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STUDY OF THE SEASONAL VARIATION OF THE TROPICAL OCEAN FRONT BETWEEN THE BRAZIL CURRENT AND THE MALVINAS CURRENT, USING OCEANOGRAPHIC AND SMS-2 SATELLITE DATA M.S. Thesis [ESTUDO DAS VARIACOES SAZONAIS DA FRENTE OCEANICA SUBTROPICAL ENTRE A CORRENTE DO BRASIL E A CORRENTE DAS MALVINAS, UTILIZANDO DADOS OCEANOGRAFICOS E DO SATELITE SMS-2]
Sueli Susana deGodoi Jun. 1983 324 p refs In PORTUGUESE; ENGLISH summary
(INPE-2780-TDL/137) Avail: NTIS HC A14/MF A01

A study of seasonal variations of the Subtropical Oceanic Front (Subtropical Convergence) between the Brazil Current and Malvinas (Falkland) Current, located in the study area between 25 deg S and 45 deg S and 045 deg W and 065 deg W, is realized by utilizing oceanographic and SMS-2 data. The images automatic interpretation was realized by utilizing the IMAGE-100 System. During the period from January 1980 to March 1981, it was observed that the seasonal variations in the longitudinal direction of this front displacement were most prominent between autumn and spring. An analysis of the statistical behavior of the SMS-2 data (10,5 - 12,6 micron spectral window) was made utilizing a Gaussian model. Some statistical examples comparing the distributions of the blackbody temperature field with cloud and cloud free conditions are presented. A quantitative evaluation of the agreement between the experimental statistics distributions and Gaussian distribution data is provided. The values of the thermal gradient of the sea surface in the region of the Subtropical Convergence are estimated. The sea surface temperatures observed by remote sensors and oceanographic data are compared. The information obtained from remote sensors and compared with oceanographic data show that remote sensing is a powerful research tool when applied to the detection and monitoring of the Subtropical Oceanic Front. Author

N84-20083# National Oceanic and Atmospheric Administration, Suitland, Md. National Environmental Satellite, Data, and Information Service.
USING THE NOAA-7 AVHRR DATA TO MONITOR EL CHICHON AEROSOL EVOLUTION AND SUBSEQUENT SEA SURFACE TEMPERATURES ANOMALIES
Alan E. Strong, Larry L. Stowe, and Charles C. Walton 1983 16 p refs Presented at the 17th Intern. Symp. of Remote Sensing of Environ., Ann Arbor, Mich., 9-13 May 1983
Avail: NTIS HC A02/MF A01

The dust veil from the April 1982 volcanic eruption of El Chichon has had a marked effect on the ability of the NOAA-7 satellite's AVHRR to monitor sea surface temperature (SST). Small micron and sub-micron sized particles of sulfuric acid in the stratosphere attenuate the radiation from Earth causing a negative offset (bias) in NOAA's operationally prouced SSTs. We have used this offset to monitor the evolution and dispersion of the aerosol cloud on a monthly basis as it spread rapidly northward during November and December 1982. Discussion is presented to show how we plan to quantitatively assess aerosol in the near future to isolate any of these effects and add more accuracy to the SST measurement despite varying amounts of atmospheric aerosol. Author

N84-20084# Calspan Corp., Buffalo, N. Y.
THE FEASIBILITY OF USING PRECURSOR AEROSOL PARAMETERS TO PREDICT VISIBILITY IN FOG AND HAZE Final Report, 2 Feb. 1982 - 15 Jul. 1983
J. T. Hanley, E. J. Mack, B. J. Wattle, and J. N. Kile Jul. 1983 67 p
(Contract F19628-82-C-0034; AF Proj. 6670)
(AD-A137141; CALSPAN-7028-M-1; AFGL-TR-83-0195) Avail: NTIS HC A04/MF A01 CSCL 04/2

Measurements were made at two AFGL-operated measurement sites in the vicinity of Cape Cod: the AFGL Weather Test Facility at Otis AFB and a remote coastal site at the Nobska Lighthouse, Woods Hole. Precursor aerosol measurements including particle and CCN concentrations, aerosol mass loading, chemical composition, and ambient visibility were obtained on a daily basis for correlation with the visibility measured in subsequent fogs or hazes associated with increasing ambient humidity. Additionally, the differences between the aerosol characteristics measured at the coastal and inland sites were investigated, and the utility of using the general wind field pattern to infer air mass aerosol characteristics was assessed. GRA

N84-20085# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE AUTOMATIC REMOTE SENSING SYSTEM ON A 320 METER METEOROLOGICAL TOWER
Xing-sheng Li, Da-zhou Zheng, Wei-hua Zhang, Jia-lin Wu, and Jin-zhao Zhu 23 Dec. 1983 27 p Transl. into ENGLISH from Qixiang Kuebao (China), v. 39, No. 1, Feb. 1981 p 70-80
(AD-A137144; FTD-ID(RS)T-1650-83) Avail: NTIS HC A03/MF A01 CSCL 04/2

The automated equipment used to measure the vertical gradient of the homogeneous field on the 320 meter meteorological tower in Beijing is discussed. Also discussed are the characteristics of the instruments installed on various levels to measure the wind direction, wind speed, temperature difference and ground temperature. Two automated processing systems are described. R.J.F.

N84-20086# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE RELATION BETWEEN THE GRAVITY CURRENT IN THE ATMOSPHERIC BOUNDARY LAYER AND LOCAL HEAVY RAINFALL
Z. Cui-juan and L. Xing-sheng 23 Dec. 1983 20 p Transl. into ENGLISH from Daqi Kexue (China), v. 6, no. 1, Mar. 1982 p 58-64
(AD-A137193; FTD-ID(RS)T-1648-83) Avail: NTIS HC A02/MF A01 CSCL 04/2

Rain detecting radars, A325 meter meteorological tower, and conventional meteorological data were used to analyze the boundary layer structures before and after the formation of a frontal storm in Beijing. As the front passed by, several surges of the gravitational current emerged in the lower level. The leading edge of each surge had a strong upward motion. The maximum reached 35 cm/sec. Each gravitational current surge was associated with a heavy rainfall. The gravitational current was capable of producing a gravitational wave with a period of several minutes up to 20 minutes. Author

N84-20087# Air Force Geophysics Lab., Hanscom AFB, Mass.
ANALYSIS OF AFGL AIRCRAFT ICING DATA
I. D. Cohen 5 Jul. 1983 48 p

(AF Proj. 6670)
(AD-A137197; AFGL-TR-83-0170; AFGL-ERP-843) Avail: NTIS HC A03/MF A01 CSCL 04/2

Data from 25 flights by a MC-130E aircraft were used to check the weather forecasting accuracy of icing conditions. Icing was observed in about 70 to 80 percent of the cases in which heavy or moderate icing was indicated, and 30 to 40 percent of those in which no icing was indicated. The data were examined as a function of altitude and temperature. Author

N84-20088# SACLANT ASW Research Center, La Spezia (Italy). Spezia (Italy).
A SYSTEM FOR RECEIVING AND ANALYZING METEOROLOGICAL SATELLITE DATA AT SMALL METEOROLOGICAL/OCEANOGRAPHIC CENTRES OR ABOARD SHIP
B. Wannamaker 1 Oct. 1983 70 p
(AD-A137215; SACLANTCEN-SR-74) Avail: NTIS HC A04/MF A01 CSCL 04/2

A system to receive and analyze visible and infrared satellite data has been developed for research purposes at SACLANTCEN. Suggestions are made for its development into an operational system to aid meteorological and oceanographic forecasts at small meteorological/oceanographic centers or aboard ship. An appendix gives an annotated list of the software routines in the present analysis system. GRA

N84-20089# Naval Postgraduate School, Monterey, Calif.
AN EVALUATION OF 700 MB AIRCRAFT RECONNAISSANCE DATA FOR SELECTED NORTHWEST PACIFIC TROPICAL CYCLONES M.S. Thesis
George Milton Dunnavan Sep. 1983 93 p
(AD-A137362) Avail: NTIS HC A05/MF A01 CSCL 04/2

The 700 mb aircraft reconnaissance data for 25 selected northwest Pacific tropical cyclones were analyzed and compared with similar data for Atlantic tropical cyclones. Correlations of observed winds and winds calculated from the height gradient indicated that the cyclostrophic equation provided a very good approximation of the observed winds, although the root mean square and bias errors suggested that a gradient wind expression was a slightly better estimate. A wind-radius relationship evaluated by Shea and Gray (1972) for Atlantic cyclones was shown to apply very well for this data set also. Based on the surface pressure-equivalent potential temperature relationship noted by Malkus and Riehl (1960), it is proposed that periods of rapid/explosive deepening are related to the inward transport to the eyewall of pulses of high equivalent potential temperature air. The evaluation of the aircraft reconnaissance data from super typhoons suggests, but does not provide conclusive proof, that such pulses do exist. GRA

N84-20090# Riso National Lab., Roskilde (Denmark).
A STUDY OF THE WEATHER RECORD FROM FANOE (1872-1980) INCLUDING AN ANALYSIS OF CLIMATE VARIATION
Ernest W. Peterson Apr. 1983 71 p
(AD-A136694; RISOE-R-483; ISBN-87-550-0925-5; ISSN-0106-2840) Avail: NTIS HC A04/MF A01 CSCL 04/2

A study of the weather record from 1872 to 1980 from the island of Fanoe, on the west coast of Jutland in Denmark, supports the findings of earlier studies which indicate that the period of the 1930's and 1940's were, climatologically, warmer than the preceeding 50 years and since about 1950. Although the annual precipitation increased up until about 1920 and remains relatively constant since, there was a maximum in shower activity, a minimum in the annual number of cyclone passages, and a maximum in the length of dry episodes in the 1930's and 1940's. There was also a climatological maximum in the severity of the winters during that period. The climatological trends are clearly, indicated in the data, when averaged over 30 years or so, and the trends in several different climate variables determined from independent measures of the weather at Fanoe are consistent with each other. However, the sizes of the trends in climate are at least an order of magnitude smaller than the standard deviations of the interannual variations in most of the weather measures. Over periods of several generations these small variations in climate cannot have had any effect on human activity when compared with the large effects caused by the international variability in the weather.Author (GRA)

N84-20091# Naval Postgraduate School, Monterey, Calif.
A QUASI-LAGRANGIAN DIAGNOSTICS INVESTIGATION OF RAPID CYCLOGENESIS IN A POLAR AIR STREAM M.S. Thesis
W. A. Cook Sep. 1983 148 p
(AD-A136844) Avail: NTIS HC A07/MF A01 CSCL 04/2

A synoptic investigation employing quasi Lagrangian diagnostic techniques was conducted for a North Atlantic Ocean polar low undergoing a period of rapid cyclogenesis. The polar low was of relatively small horizontal scale and developed in a region of low static stability and large low level baroclinity, which is consistent with theoretical studies. Rapid surface pressure falls and vigorous circulation increases correlate well with the observed maxima in low level inward mass transport and upper-level mass outflow, and are temporally coincident with the incursion of the forward divergence quadrant of a jet streak into the budget volume. The most rapid increases of absolute vorticity occurred in the 250 to 300 mb layer, and are related to combined contributions of positive vorticity advection and vertical redistribution processes. The dominant forcing of low level absolute vorticity increases comes primarily from the divergence source term. Author (GRA)

N84-20092# Royal Netherlands Meteorological Inst., De Bilt. Bureau Vorming en Opleiding.
THE READING OF PLOTS IN WEATHER AND WATER WAVE CHARTS [HET LEZEN VAN PLOTJES IN DE WEER- EN GOLF-KAARTEN]
Sep. 1983 37 p In DUTCH
(KNMI-152-BV-10) Avail: NTIS HC A03/MF A01

Interpretation of plots in synoptic, aerological and wave charts is outlined. Codes, plot models, explanations, and examples are given for each case. Author (ESA)

N84-20093# Royal Netherlands Meteorological Inst., De Bilt.
A MODEL TO CALCULATE HOURLY TEMPERATURES FROM THREE REGULAR READINGS, PART 3 [EEN REKENMODEL DAT HET VERLOOP VAN DE TEMPERATUR OVER EEN ETMAAL BEREKENT UIT DRIE TERMIJNMETINGEN VAN DE TEMPERATUUR, DEEL 3]
A. F. V. VanEngelen and H. A. M. Geurts Aug. 1983 46 p refs In DUTCH; ENGLISH summary
(KNMI-165-3) Avail: NTIS HC A03/MF A01

A model to calculate temperatures for any hour of a given day from a small number of regular readings at any other hour of the same day was tested on records for the period 1971 to 1980. For every day in this period the daily mean temperature calculated from 24 recorded hourly values was compared with the daily mean temperature calculated from three regular readings on that day. The results are very satisfactory and the proposed calculation method is recommended for processing historical temperature readings. Author (ESA)

N84-20094# Royal Netherlands Meteorological Inst., De Bilt. Fysisch Meteorologish Onderzoek.
OBSERVATIONS OF SURFACE WATER TEMPERATURE AND SALINITY IN THE EAST SCHELDT DURING THE PERIOD 1894-1982
P. C. T. VanderHoeven 1983 99 p refs In DUTCH; ENGLISH summary
(KNMI-WR-83-12(FM)) Avail: NTIS HC A05/MF A01

Measurements of water temperature and salinity in the eastern part of the Scheldt were collated to yield a homogeneous series from 1894-1982. Salinities are reliable, but corrections have to be made for differences in times and points of observation of water temperature. Author (ESA)

N84-20095# Royal Netherlands Meteorological Inst., De Bilt. Dynamisch Meteorologisch Onderzoek.
WEATHER EFFECTS ON ELECTRICITY PEAK LOADS IN THE

SOUTHWEST OF THE NETHERLANDS AND VERIFICATION OF THE ESTIMATION OF THESE MAXIMA, 1 JANUARY 1972 - 1 JANUARY 1983 [OVER DE INVLOED VAN HET WEER OP ELECTRICITEITSMAXIMA EN VERIFICATIE VAN SCHATTINGEN DEZER MAXIMA GEDURENDE DE PERIODE 1 JANUARI 1972 - 1 JANUARI 1983 IN ZUID HOLLAND]

A. W. Hanssen 1983 24 p refs In DUTCH; ENGLISH summary (KNMI-WR-83-14(DM)) Avail: NTIS HC A02/MF A01

Peak loads on the electric power system on working days were related to cloudiness and temperature. Wind velocity and precipitation were abandoned because of a lack of data. The relationship is established after elimination of the effects of nonmeteorological parameters, i.e., long term trends, seasonal variations and character of the day. Daily load was estimated using a semiobjective method. The estimates, which are highly dependent on accurate weather forecasting, are verified, and results are summarized. The mean error deviations in the daily load forecasts amount to 28.0 MW (24 hr forecasts) and 20.6 MW (8 hr forecasts) corresponding to 1.7% and 1.3% of the mean load, respectively. Author (ESA)

N84-20096# Royal Netherlands Meteorological Inst., De Bilt. Centrale Weerdienst.

THE STORM OF 12 MAY 1983, ASCENSION DAY [DE STORM VAN MEI (HEMELVAARTSDAG) 1983]

C. Floor and G. S. Forbes 1983 43 p refs In DUTCH (KNMI-TR-44(CWD)) Avail: NTIS HC A03/MF A01

A short severe storm along the Dutch coast and the Ysselmeer are analyzed. The trajectory of the depression, the wind field, and storm damage are traced. Author (ESA)

N84-20097# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.

COMPREHENSIVE ANALYSES OF VARIANCES OF METEOROLOGICAL FIELDS OVER SOUTHERN BAVARIA Ph.D. Thesis - Technische Univ., Munich

Hans Volkert Sep. 1983 155 p refs In GERMAN; ENGLISH summary (DFVLR-FB-83-31) Avail: NTIS HC A08/MF A01; DFVLR, Cologne DM 46

Daily deviations from the annual cycle are determined for climate data collected on a routine basis with an extended network of stations. Quantitative measures for space and time dependence of anomaly patterns for single climate elements and several in combination were obtained by analyses of variance. Subsamples (foehn events, abundant areal precipitation) were investigated. It is found that the extensive analysis of variance employed is well suited for climatological investigations of variations of climate elements about their average values. Author (ESA)

N84-20098# National Weather Service, Silver Spring, Md. Techniques Development Lab.

AFOS (AUTOMATION OF FIELD OPERATIONS AND SERVICES)-ERA FORECAST VERIFICATION

Mary M. Heffernan, Mary C. Newton, and Robert L. Miller Oct. 1983 50 p (PB84-129303; NOAA-NWS-TDL-CP-83-3; NOAA-83120901) Avail: NTIS HC A03/MF A01 CSCL 04B

The National Weather Service (NWS) is implementing a national forecast verification system which utilizes the processing and communication capabilities of the Automation of Field Operations and Services (AFOS) system. This AFOS-era forecast verification (AEV) system is a major step in implementing the National Verification Plan. Local and guidance forecasts of public and aviation elements are verified for two forecast cycles per day. The AEV system is designed to collect and collate forecasts and observations to provide a local, quality controlled data base; to transmit data to a central site; to provide a permanent central archive; and to produce local, regional, and national summaries. The local verification software is designed to extract the forecasts and observations for verification from the AFOS products automatically. Author (GRA)

N84-20099# National Oceanic and Atmospheric Administration, Miami, Fla. Office of Aircraft Operations.

CALIBRATION OF METEOROLOGICAL MEASUREMENTS MADE BY NOAA (NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION) WP3D AIRCRAFT, 1983

F. J. Merceret, R. J. DeVivo, H. W. Davis, and J. R. Parrish Nov. 1983 54 p refs (PB84-127463; NOAA/TM-OAO-1; NOAA-83120104) Avail: NTIS HC A04/MF A01 CSCL 04B

Techniques used by the Office of Aircraft Operations (OAO) to calibrate its airborne meteorological measurements are described and results for fiscal year 1983 are presented. Appendices describe the facilities used for calibration and list calibrations done since 1979. Author (GRA)

N84-20100# National Oceanographic Data Center, Washington, D. C. National Environmental Satellite, Data and Information Service.

MARINERS WEATHER LOG, VOLUME 27, NUMBER 2, FALL 1983

Elwne Wilson, ed. 1983 64 p refs (PB84-133115; NOAA-83121404) Avail: NTIS HC A04/MF A01 CSCL 04B

Various topics in marine meteorology are discussed. A dust storm in the western Sahara on 23 July 1982 that reached Florida on 30 July 1982 and extended northward to a latitude of 30 deg N. was recorded by the Geostationary Operational Environmental Satellite (GOES). The GOES system provides timely data for monitoring large scale global events. The western North Pacific area experienced below average tropical cyclone activity for 1982. Only two tropical cyclones reached super typhoon intensity from a total of 19 storms. Storm frequency, intensity, pressure, and typhoon track were monitored in each case. Tropical cyclones in the North Indian Ocean were monitored according to satellite and land based observations that tracked, and measured the characteristics of each storm. M.A.C.

N84-20101# National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.

FGGE LEVEL 3-B DAILY GLOBAL ANALYSES, PART 3 Data Report, Jun. - Aug. 1979

J. J. Ploshay, R. K. White, and K. Miyakoda Oct. 1983 292 p refs (PB84-135854; NOAA-DL-ERL-GFDL-3; NOAA-83121901) Avail: NTIS HC A13/MF A01 CSCL 04B

The purposes of FGGE are to observe comprehensively and accurately the atmospheric state and circulation on a global scale, and to increase understanding of the dynamics of the equatorial atmosphere and ocean to ultimately improve weather and climate prediction. Analyses cover from June 1979 through August 1979. Each day at 00 Greenwich Mean Time, four levels of polar stereographic maps of the northern and southern hemispheres as well as two levels of tropical streamlines and isotachs, are presented. GRA

N84-20102# Drexel Univ., Philadelphia, Pa. Dept. of Physics and Atmospheric Sciences.

NUMERICAL STUDY OF MESOSCALE CONVECTIVE COMPLEXES Final Report

D. J. Perkey Aug. 1983 71 p refs (Grant NA81RA-D-00034) (PB84-136506; NOAA-83122001) Avail: NTIS HC A04/MF A01 CSCL 04B

On 25 April, 1975 as part of the National Aeronautics and Space Administration's Atmospheric Variability Experiment IV (AVE IV) frequent upper air soundings were taken at eastern United States synoptic sounding sites. An intense, long lived mesoscale convective weather system developed late in the AVE IV period and moved eastward during the experiment. Using dry and moist numerical simulations interactions between the widespread, long lived convective complex and its large scale environment are examined. Dissecting the differences between moist and dry simulations reveals that significant, up scale feedbacks occur, within

the numerical simulation, between the convective system and its large scale meteorological setting. Pronounced differences in temperature, divergence, vorticity and height are observed to develop. GRA

N84-20103# National Weather Service, Garden City, N.Y.
SLICK AND QUICK DATA ENTRY FOR AFOS ERA VERIFICATION (AEV) PROGRAMS
A. P. Blackburn Dec. 1983 32 p refs
(PB84-138726; NOAA-NWS-ERCP-14; NOAA-84010305) Avail: NTIS HC A03/MF A01 CSCL 04B

The two programs VF1 and VF2 enter missing forecast data and missing or corrected surface observations for the Air Force Operation Service (AFOS) Era Vertification (AEV) a single AFOS database product. The VF1 creates and fills a preformat CCCMCPVFY from collated PVM and AVM files. The VF2 reads CCCVFYCCC (created from CCCMCPVFY with message comp) and enters the data into the PVM and AVM files. The purpose of the programs is to enter forecast and observational data from a single AFOS database product. GRA

N84-20104# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
ANALYSIS AND CLASSIFICATION OF MESOSCALE CLOUD AND PRECIPITATION SYSTEMS
D. A. Matthews Aug. 1983 450 p refs
(PB84-138999) Avail: NTIS HC A19/MF A01 CSCL 04B

Four distinct meso-beta scale cloud systems were defined and analyzed using satellite and global radar data to produce more homogeneous classes of precipitation events in the west Texas High Plains region. They were: isolated convective cells; convective clusters, cloud lines, and mesosynoptic systems. A nearly logarithmic increase in total rain volume and mesoscale precipitation efficiency was observed from isolated cells to mesosynoptic systems. Automated band pass objective analyses of 7 rawinsondes separated by 80 to 100 km in a meso-beta (25-250 km) scale network with observations every 3 h were used to compute the kinematic controls of mesoscale forcing within the 1979 Texas HIPLEX field program. GRA

N84-20105 Colorado State Univ., Fort Collins.
EXPERIMENTS WITH A SPECTRAL TROPICAL CYCLONE MODEL Ph.D. Thesis
Mark DeMaria 1983 234 p
Avail: Univ. Microfilms Order No. DA8327961

The three layer balanced axisymmetric tropical cyclone model is generalized to three dimensions and the resultant primitive equations are solved using the Galerkin method with Fourier basis functions on a doubly-periodic mid-latitude beta plane. The nonlinear terms are evaluated using the transform method where the necessary transforms are performed using FFT algorithms. The spectral equations are transformed so that the dependent variables represent the normal modes of the linearized equations. In this form, the application of nonlinear normal mode initialization is straightforward. The model is run with an axisymmetric initial condition of an f-plane and it is shown that many of the results can be reproduced. The energy of the gravity and rotational modes are calculated and it is shown that the gravity mode energy is more than an order of magnitude smaller than the rotational mode energy. Dissert. Abstr.

N84-20106 Pennsylvania State Univ., University Park.
FRONTOGENESIS IN A MOIST ATMOSPHERE Ph.D. Thesis
Eirh-Yu Hsie 1983 282 p
Avail: Univ. Microfilms Order No. DA8327505

The effects of condensation and evaporation on mesoscale frontal circulations in a two dimensional numerical model are investigated. Utilizing an explicit prediction scheme for the prediction of water vapor, cloud water, and rainwater, the model is used to investigate the interactions between convection and the larger scale environment. The model results are qualitatively compared with recent observations from the SESAME-AVE (Severe Environmental Storms and Mesoscale Experiment - Atmospheric Variability Experiment) experiment. Diagnostic calculations, based on the Sawyer-Eliassen secondary circulation equations, determine the contributions to the frontogenesis by different physical mechanisms. In the frontal simulations, the effects of condensation produce a much stronger front compared to a dry simulation. The model with the explicit scheme simulates some realistic features observed in the atmosphere. Dissert. Abstr.

N84-20107 Colorado State Univ., Fort Collins.
ANALYSIS AND CLASSIFICATION OF MESOSCALE CLOUD AND PRECIPITATION SYSTEMS Ph.D. Thesis
David Aaron Matthews 1983 449 p
Avail: Univ. Microfilms Order No. DA83-27979

Four distinctly different meso-beta scale cloud systems were objectively defined and analyzed using satellite imagery and digital radar data to produce more homogeneous classes of precipitation events in the west Texas High Plains region. The four classes were: (1) isolated convective cells, (2) convective clusters, (3) cloud lines, and (4) mesosynoptic systems. A nearly logarithmic increase in total rain volume and mesoscale precipitation efficiency was observed from isolated cells to mesosynoptic systems. Automated band-pass objective analyses of seven rawinsondes separated by 80 to 100 km in a meso-beta (25 to 250 km) scale network with observations every 3 h were used to compute the kinematic controls of mesoscale forcing within the Texas HIPLEX field program. Vertical motion and vertical moisture flux were highly correlated in time and space with the intensity and location of clouds and precipitation. Dissert. Abstr.

N84-20108 Maryland Univ., College Park.
SEASONAL CLIMATE FLUCTUATIONS AS STEADY AND PERIODIC FLOW STATES OF A BAROTROPIC MODEL OF PLANETARY WAVES Ph.D. Thesis
Juan Rivero 1982 228 p
Avail: Univ. Microfilms Order No. DA83-23579

The variability of the seasonal climate may be due, not only to variations in the atmospheric forcing fields, but to internal variability due to the nonlinear nature of the governing equations. This concept is developed by considering the interactions between planetary waves at different planetary wave numbers, using a spectral form of the barotropic equation on the sphere, driven by the effects of large scale orography, friction, and momentum forcing. The model is truncated to the minimum number (three) of planetary waves permitting mutual interactions. Zonal flow is also included. The steady state properties of the model are identical to those of a simpler model with wave-zonal flow interactions, due to Charney and DeVore. Only one planetary wave mode (the middle wave) has nonzero amplitude, with three possible values; giving rise to subresonant, low superresonant and high superresonant flow states according to the zonal flow value.
Dissert. Abstr.

N84-20060# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
RADIATION AND CLOUDS, THE INTERNATIONAL SATELLITE CLOUD CLIMATOLOGY PROJECT (ISCCP)
E. Ruprecht, C. Simmer, and S. Brandt *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 123-126 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

N84-20061# Lille Univ. (France). Lab. d'Optique Atmospherique.
THE NEPHOS PROGRAM: PRELIMINARY RESULTS
B. Bonnel, J. C. Buriez, Yves Fouquart, and J. J. Morcrette *In* Cologne Univ. Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 127-131 refs (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

N84-20062# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
ON THE DERIVATION OF CLOUD STRUCTURE PARAMETERS

FROM AIRCRAFT MEASUREMENTS
J. Schmetz and Frank-Juergen Diekmann *In its* Satellite Meas. of Radiation Budget Parameters Oct. 1983 p 132-137 (For primary document see N84-20044 10-46)
Avail: NTIS HC A08/MF A01

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-20109# Naval Postgraduate School, Monterey, Calif.
ANALYSIS OF OBSERVED AND MODELED MIXED LAYERS: NOCAL (NORTHERN CALIFORNIA) REGION M.S. Thesis
D. C. Durban Sep. 1983 189 p
(NR Proj. 083-275; RR0310301)
(AD-A136773; NPS68-83-005) Avail: NTIS HC A09/MF A01 CSCL 08/10

Surface mixed layer properties off Northern California (NOCAL) were analyzed statistically and numerically. The observations were acquired on three cruises as part of the Pilot Ocean Prediction Study of the California Current eddies centered ca. 37 to 39N, 125 to 127W during March and August 1982. Mixed layer depth, averaging 33 + or - 14m, had a horizontal correlation scale of no more than 35Km, which has significance for relating thermal structure information form individual temperature profiles to that of Fleet Numerical Oceanography Center's (FNOC) analyses based on a grid length of approximately 300km. Simulations and sensitivity tests were made using the Garwood bulk mixed layer model and the Mellor Level-2.5 diffusion model with the initial and boundary conditions acquired at sea and from FNOC. Upper ocean thermal structure analyses and forecasts were also obtained from the Navy's TOPS/TOPS-EOTS diffusion model, which has since become operational at FNOC. Comparisons of observations, analyses, and model solutions reveal consistent cooling and deepening by the former two models and excessive warming by the latter model. These significant differences are believed to be related to model resolution, model sensitivity, oceanic and atmospheric data quality, and spatial variability. Author (GRA)

N84-20110# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
OPEN WATER AND THIN ICE DETECTION IN THE ARCTIC MARGINAL ICE ZONE USING REFLECTOMETER SIGNAL ANALYSIS Final Report
C. J. Radl and J. P. Welsh Mar. 1983 35 p
(AD-A136043; NORDA-TN-209) Avail: NTIS HC A03/MF A01 CSCL 08/3

Approximately 2000 kilometers (approx. 1250 statute miles) of reflectometer data collected within 160 kilometers (100 statute miles) of the ice edge in the North American Arctic were analyzed. The reflectometer signal, which shows a sharp decrease in areas of open water/thin ice, was used to initiate and develop a method to begin an evaluation of the frequency of occurrence and percentage of open water from the ice edge to approximately 160 kilometers (100 statute miles). Comparisons were made within and among regional data sets. Individual regions were not unambigously identifiable by lead width and frequency characteristics. Distance into the pack from the ice edge did not have a direct relationship to the frequency or percentage of open water. The result of no apparent relationship between the frequency of occurrence and percent of area of open water may be due to the restricted samples--restricted in season and total area covered.
Author (GRA)

N84-20111# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
STATISTICS OF VERTICAL SHEAR FROM A HEMISPHERIC MODEL Final Report
J. M. Harding, R. H. Preller, and S. A. Piacsek Sep. 1983 51 p
(AD-A136179; NORDA-TN-206) Avail: NTIS HC A04/MF A01 CSCL 08/10

Using surface atmospheric momentum and heat fluxes derived from the Fleet Numerical Oceanography Center's weather prediction models, a computation of inertial and Ekman shear was done for the upper 400 m of the North Pacific and North Atlantic. Two 60-day periods were considered in November and December of 1976 and 1980. A capability to predict these types of shear in realtime, or near real-time, is demonstrated using the Navy's TOPS (Thermodynamic Ocean Prediction System) model, A statistical analysis of the vertical shear and associated Richardson number revealed that the time variability of shear appears to be linked primarily to the synoptic time scales of weather events; and the spatial diaribution of shear instability (0 or = Ri < or = 0.25) and high shear are closely related to the position of atmospheric fronts. GRA

N84-20112# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data and Information Service.
GULF STREAM SYSTEM LANDWARD SURFACE EDGE STATISTICS
S. J. Auer Oct. 1983 28 p refs
(PB84-104314; NOAA/TM/NWS/NMC-67; NOAA-83101201) Avail: NTIS HC A03/MF A01 CSCL 08C

This paper represents a statistical evaluation of the mean position, standard deviation, and maximum northward and southward positions of the Gulf Stream System landward surface edge. The surface edge is determined for each 0.5 degrees longitudinal transect from 91 - 44 degrees W measuring the course of the Gulf Stream System from the Yucatan Strait to the Grand Banks. These statistics are derived from the initial year of the daily Oceanographic Analysis, which contains synoptic frontal locations of the Gulf Stream System. The Gulf Stream System can be subdivided into two major regions: The Loop Current, located in the Gulf of Mexico, and the Gulf Stream, located in the Northwest Atlantic Ocean. The Gulf Stream System's edge is named a landward surface edge in this paper to signify that it is the edge nearest to the North American continental landmass.
Author (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-20113*# Scripps Institution of Oceanography, La Jolla, Calif.
[PROCHLORON RESEARCH] Final Report
Ralph A. Lewin and Lanna C. Cheng 1983 2 p
(Grant NAGw-181)
(NASA-CR-173264; NAS 1.26:173264) Avail: NTIS HC A05/MF A01 CSCL 06C

The purpose was to prepare Prochloron photosynthetic membranes for the isolation of the two major chlorophyll-proteins, the P700-chlorophyll a-protein and the light-harvesting chlorophyll a/b-protein, using SDS-polyacrylamide gel electrophoresis. The prepared proteins (purified) were examined for their cross-reactivity to polyclonal antibodies prepared from higher plant proteins. In addition, material was prepared for electron microscopy, and isolation of the DNA for determination of its general complexity (COT analysis) and similarity to barley chloroplast DNA and Anabaena DNA by using restriction-endonuclease analysis. Kleinschmidt spreads of the DNA were in the electron microscope to identify and measure the extent and size of the circlar DNA. For individual titles, see N84-20114 through N84-20124.

N84-20114*# Scripps Institution of Oceanography, La Jolla, Calif.
PROCHLORON ON SYNAPTULA
Lanna Cheng and Ralph A. Lewin *In its* Prochloron Res. 1983 8 p refs (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 06C

It is reported that, for the first time, Prochloron cells were found associated with an animal other than a colonial ascidian-

namely, a synaptid holothurian, Snaptula lamperti. This occurance brings into question the supposedly obligate nature of the association of this problematic algae with didemnids and their allies. R.J.F.

N84-20115*# Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). Plant Physiology Unit.
A COMPARATIVE STUDY OF THE FATTY ACID COMPOSITION OF PROCHLORON LIPIDS
Janette R. Kenrick, Elizabeth M. Deane, and David G. Bishop *In* Scripps Institution of Oceanography Prochloron Res. 1983 10 p refs Prepared in cooperation with Macquarie Univ., North Ryde, Australia (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 06C

The chemical analysis of lipids of Prochloron isolated from several hosts is discussed. The object was to determine whether differences in lipid composition could be used to characterize organisms from different sources. Major lipid components are given. An analysis of fatty acid composition of individual lipids slowed a distinctive disstribution of fatty acids. While present results do not justify the use of fatty acid content in the taxonomy of Prochlon, the variations found in the lipids of cells from the same host harvested from different areas, or at different times in the same area, suggest that a study of the effects of temperature and light intensity on lipid composition would be rewarding. R.J.F.

N84-20116*# Scripps Institution of Oceanography, La Jolla, Calif.
PROCHLORON Status Report
Ralph A. Lewin *In its* Prochloron Res. 1983 17 p refs (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 06C

A review is given of the research problems associated with Prochloron. Two questions are discussed in detail. Did prochlorophytes arise in independently off cyanophytes, or did one of these classes arise from the other? If eukaryotic chlorophytes originated by symbiogenesis, might their plastids have arisen from symbiotic, endophytic prochlorophyte-like ancestors? R.J.F.

N84-20117*# Scripps Institution of Oceanography, La Jolla, Calif.
PROCHLORON-ASCIDIAN SYMBIOSES: PHOTOSYNTHETIC POTENTIAL AND PRODUCTIVITY
Ralph A. Lewin, Lanna Cheng, and Randall S. Alberte (Chicago Univ.) *In its* Prochloron Res. 1983 11 p refs (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 06C

The chlorophyll content of didemnid asidians with symbiotic algae (Prochloron) from oligotropic tropical marine waters around Palau, Western Carolin Islands is discussed. Several species contain as much chlorophyll per unit dry weight as many herbaceous crop plants and more than do other symbiotic associations such as lichens, green Hydra, etc. Their chlorphyllA/B ratios (3-9) were generally much lighter than those of angiosperms (2-4). Where they abound, Prochloron - ascidian symbiosis could make a major contribution to the productivity, especially in localized areas of tropical marine waters characterized by low nutrient levels and high irradiance. R.J.F.

N84-20118*# Scripps Institution of Oceanography, La Jolla, Calif.
DIURNAL RHYTHM IN THE CELL-DIVISION FREQUENCY OF PROCHLORON (PROCHLOROPHYTA) IN NATURE
Ralph A. Lewin, Lanna Cheng, and Jaime Matta *In its* Prochloron Res. 1983 13 p refs (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 07C

Frequencies of cell division stages in suspensions of Prochloron cells, expressed at regular intervals throughout a natural day-night cycle from several colonies of four species of host didemnid, are given. The proportion of dividing cells of Prochloron living symbiotically in colonies of a didemnid, Diplosoma virens, rises from about 4% during the night (20.00-04.00 hrs.) to about 13% in the morning (0,.00-12.00 hrs.), and then falls again in the afternoon. Similiar, though less pronounced, changes were observed among Prochloron cells in two other symbiotic didemnids, Lissoclinum patella and L. voeltzkowi. R.J.F.

N84-20119*# Scripps Institution of Oceanography, La Jolla, Calif.
CHLOROPHYLL AND CAROTENOID PIGMENTS OF PROCHLORON (PROCHLOROPHYTA)
Hans W. Paerl (North Carolina Univ., Morehead City), Ralph A. Lewin, and Lanna Cheng *In its* Prochloron Res. 1983 17 p refs (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 06C

High-performance liquid chromatography (HPLC) with a gradient-elution technique was utilized to separate and quantify chlorophylls a and b as well as major carotenoid pigments present in freeze-dried preprations of prochloron-didemnid associations and in Prochloron cells separated from host colonies. Results confirm earlier spectrophotometric evidence for both chlorophylls a and b in this prokaryote. Chlorophyll a:b ratios range from 4.14 to 19.71; generally good agreement was found between ratios determined in isolated cell preprations and in symbiotic colonies (in hospite). These values are 1.5 to 5-fold higher than ratios determined in a variety of eukaryotic green plants. The carotenoids in Prochloron are quantitatively and qualitatively similar to those found in various freshwater and marine blue-green algae (cyanopbytes) from high-light environments. However, Prochloron differs from cyanophytes by the absence of myxoxanthophyll and related glycosidic carotenoids. It pigment characteristics are considered sufficiently different from those of cyanophytes to justify its assignment to a separate algal division. Author

N84-20120*# Chicago Univ., Ill.
PROCHLORON EXPEDITION Status Report
Randall S. Alberte *In* Scripps Institution of Oceanography Prochloron Res. 1983 3 p (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 06C

The purpose was to prepare Prochloron phototsynthetic membranes for the isolation of the two major chlorophyll-proteins, the p700-chlorophyll a protein and the light harvesting chlorophyll a/b-protein, using SDS-polyacrylamide get electrophoreses. The prepared proteins (purified) were examined for their cross-reactivity to polyclonal antibodies prepared from higher plant proteins. In addition, material was prepared for electron microscopy, and isolation of the DNA for determination of its general complexity (COT analysis) and similarity to barley chloroplast DNA and Anabaena DNA by using restriction-endonuclease analysis Kleinschmidt spreads of the DNA were in the electron microscope to identify and measure the extent and size of the circular DNA. R.J.F.

N84-20121*# Colorado Univ., Boulder.
REPORT OF PROCHLORON RESEARCH
Ray Fall and Lana Fall *In* Scipps Institution of Oceanography Prochloron Res. 1983 3 p (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 06C

The goal was to assay enzynes in situ in Prochloron, and to prepare active enzyme preparations for future use. In addition, photosynthesis as an indicator of whole cell viability was measured. This indicator was used to monitor extended survival of Prochloron cells after their removal from the host animal. R.J.F.

N84-20122*# Scripps Institution of Oceanography, La Jolla, Calif.
REPORT OF PROCHLORON RESEARCH, IPE-7 (PALAU, FEBRUARY 1982)
Ralph A. Lewin and Lanna Cheng *In its* Prochloron Res. 1983 4 p (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 06C

Various aspects of Prochloron research are discussed. At suitable low-tide periods about 5-6 new sites were surveyed as possible convenient sources of symbiotic didemnids. The Kanori Channel site peviously surveyed during IPE-VI remains by far the best, in terms of species, quantities and accessibility. Prochloron from the six major species of symbiotic didemnids was compared

serum, cell size and vacuolation, etc. Tadpoles from Lissoclinum patella colonies were observed emerging from cloacal apertures; about 400 were collected. All but 4 carried a girdle of symbiotic Prochloron cells (about 40,000 per larva). Observations were made on cell viability indicated that a marked increase in protoplasm viscosity of the cell contents was associated with cell death. Living cells, in 5 microlitres of buffered sea water under a coverslip, when pressed with a 2 kg weight for 10 seconds, attempts made to culture Prochloron in sea-water media. R.J.F.

N84-20123*# Scripps Institution of Oceanography, La Jolla, Calif.
IPE 7
In its Prochloron Res. 1983 2 p (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 06C

A description is given of the collection and treatment of samples of Prochloron cells. The cells of Prochloron were obtained and prepared in the following way. Colonies of the symbiotic host, the giant didemnid ascidian Lissoclinum patella, were collected at low-tide level on reef-flat sand between Kamori Island and Koror, Palau, Western Caroline Islands. The animal colonies were taken, immersed in sea water, to an 8,000-litre holding tank and kept with constantly running sea water at 30 deg. Individual colonies were picked clean of contaminants, rinsed in sea water buffered with 40 nM or 100 mM Tris buffer at pH 8.4, and squeezed by hand to express the algal cells from the cloacal atria. The algae were received in about an equal volume of the same buffered sea water; this neutralized the acids liberated by the bruised ascidians and thereby maintained the Ph high enough to keep the algal cells green. The Prochloron cells were washed twice with buffered sea water and concentrated by centrifugation at about 50 g for 90 seconds. Microscopic examination revealed that contamination by animal host cells or bacteria was negligible (much less than 1%). R.J.F.

N84-20124*# California Univ., Irvine.
PROCHLORON EXPEDITION
Grover C. Stephens *In its* Prochloron Res. 1983 2 p (For primary document see N84-20113 10-51)
Avail: NTIS HC A05/MF A01 CSCL 06C

Prochloron requires a source of N. It can obtain this from its didemnid symbiont as NH (sub4) or amino acids or both. It may obtain it from sea water as do free-living algae (FAA), but this is not likely to be the major source due to diomass consideration. R.J.F.

N84-20125*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NITRITE REDUCTION IN PARACOCCUS HALODENITRIFICANS: EVIDENCE FOR THE ROLE OF A cd-TYPE CYTOCHROME IN AMMONIA FORMATION
Lawrence I. Hochstein and Sonja E. Cronin Jan. 1984 26 p refs
(NASA-TM-85883; A-9562; NAS 1.15:85883) Avail: NTIS HC A03/MF A01 CSCL 06C

Cell-free extracts prepared from Paracoccus halodenitrificans catalyzed the reduction of nitrate to ammonia in the presence of dithionite and methyl viologen. Enzyme activity was located in the soluble fraction and was associated with a cytochrome whose spectral properties resembled those of a cd-type cytochrome. Unlike the sissimilatory cd-cytochrome nitrate reductase associated with the membrane fraction of P. halodenitrificans, this soluble cd-cytochrome did not reduce nitrite to nitrous oxide. Author

N84-20126*# Virginia Univ., Charlottesville. Dept. of Physiology.
RAT BODY SIZE, COMPOSITION AND GROWTH AT HYPO- AND HYPERGRAVITY Final Report
Grover C. Pitts 15 Jul. 1983 8 p
(Grant NsG-2225)
(NASA-CR-175393; NAS 1.26:175393) Avail: NTIS HC A02/MF A01 CSCL 06C

The effects of hypergravity (centrifugation) on body composition were investigated. Hypogravitational and hypergravitational aspects were reflected in the research effort. A list of publications is provided. N.W.

N84-20127*# National Aeronautics and Space Administration, Washington, D. C.
STUDIES ON PROTEINOGRAMS IN DERMATORPHYTES BY DISC ELECTROPHORESIS. PART 2: PROTEIN BANDS OF KERATINOPHILIC FUNGI
P. Danev, V. Balabanov, and E. Friedrich Jul. 1983 8 p refs Transl. into ENGLISH from Dermatol. Venerol. (USSR), v. 19, no. 2, 1980 p 86-89 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77096; NAS 1.15:77096) Avail: NTIS HC A02/MF A01 CSCL 06C

Disc electrophoresis studies on keratinophili fungi demonstrated corresponding proteinograms in morphologically homogeneous strains of the same species, but different in different species of one and the same genus. Author

N84-20128*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BIOMEDICAL RESEARCH DIVISION SIGNIFICANT ACCOMPLISHMENTS FOR FY 1983
Norman V. Martello (Nelson and Johnson Engineering, Inc.) Feb. 1984 171 p refs
(NASA-TM-85929; A-9681; NAS 1.15:85929) Avail: NTIS HC A08/MF A01 CSCL 06C

Various research and technology activities of Ames Research Center's Biomedical Research Division are described. Contributions to the Space Administration's goals in the life sciences include research in operational medicine, cardiovascular deconditioning, motion sickness, bone alterations, muscle atrophy, fluid and electrolyte changes, radiation effects and protection, human behavior and performance, general biomedical research, and gravitational biology. Author

N84-20129# Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
US ARMY MEDICAL BIOENGINEERING RESEARCH AND DEVELOPMENT LABORATORY, FISCAL YEAR 1983 Annual Progress Report, 1 Oct. 1982 - 30 Sep. 1983
T. L. Trudeau 1 Oct. 1983 177 p
(DA Proj. 3A1-61101-A-91-C; DA Proj. 3E1-61102-BS-04)
(AD-A136926) Avail: NTIS HC A09/MF A01 CSCL 06/5

The Annual Progress Report, Fiscal Year 1983, summarizes research performed by the US Army Medical Bioengineering Research and Development Laboratory in projects authorized by the Surgeon General, the US Army, and the Commander, US Army Medical Research and Development Command and supported by RDTE funds from the US Army Medical Research and Development Command. Author (GRA)

N84-20130# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
CRYOMICROTOME APPLICATIONS: TECHNIQUES FOR THE STUDY OF SKELETAL MATERIALS
Katherine C. Smith, Clarence M. Oloff, and Leon E. Kazarian Sep. 1983 20 p
(AF Proj. 7231)
(AD-A137010; AFAMRL-TR-83-074) Avail: NTIS HC A02/MF A01 CSCL 14/2

The LKB 2250 PMV Cryomicrotome is a large sledge-type microtome designed for sectioning both undecalcified bone and specimens of large size. The maximum specimen size is 150 x 450 mm, sufficient for an entire rabbit or small monkey. GRA

N84-20131# Argonne National Lab., Ill. Div. of Biological and Medical Research.
ULTRASTRUCTURAL EFFECTS OF RADIATION ON CELLS AND TISSUES: CONCLUDING REMARKS
Thomas M. Seed and Kate E. Carr (Glasgow Univ.) 1982 3 p

Presented at the Scanning Electron Microscopy Ann. Meeting, Anaheim, Calif., 25 Apr. 1982
(Contract W-31-109-eng-38)
(DE84-003454; CONF-820409-6) Avail: NTIS HC A02/MF A01

The complex nature of the biological response to ionizing radiation and the inherent difficulties associated with developing unifying concepts and definitions was indicated. The multiplicity of the major response variables, i.e., specimen type, radiation parameters, analytical approach and endpoints measured, is undoubtedly a major problem. The specimens which ranged from eucaryotic algae grown in vitro in suspension cultures to brain tissue of cancer patients were analyzed. Specimens were irradiated with now fewer than seven types of ionizing radiation, which varied both in quality and quantity. Exposure regimens included single, fractionated, and chronic exposures. There are major differences in the analytical approach employed and end points measured.
DOE

N84-20132# Research Inst. of National Defence, Umea (Sweden). Dept. 4.
EFFECTIVENESS OF A DEVICE FOR DETECTION OF BACTERIOLOGICAL AEROSOLS; IMPROVEMENTS IN STANDARDIZATION AND SENSITIVITY IN THE LABORATORY
Pia Hallin, Gunilla Linfors, and Gunnar Sandstroem Aug. 1983 20 p refs In SWEDISH; ENGLISH summary
(FOA-C-40175-B2; ISSN-0347-2124) Avail: NTIS HC A02/MF A01

A device for detecting bacteriological aerosols, based upon the alkaline luminolperborate reaction with ironporphyrins (e.g., hematin) in microbes, and especially bacteria, was developed. Standard calibration curves for different bacteria were produced, and a mean value curve from these curves is used for the determination of the amount of bacteria in an unknown air sample. The sensitivity limit for the system is 10,000 cells/cum of air.
Author (ESA)

N84-19430# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
BIOLOGICAL LIFE SUPPORT SYSTEM
H. P. Leiseifer, A. I. Skoog, and A. O. Brouillet (Hamilton Standard, Windsor Locks, Conn.) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 289-298 refs Previously announced in IAA as A84-11755 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-20133* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: 1983 CUMULATIVE INDEX
Jan. 1984 428 p
(NASA-SP-7037(170); NAS 1.21:7037(170)) Avail: NTIS HC $10.00 CSCL 06E

This bibliography is a cumulative index to the abstracts contained in NASA SP-7037 (158) through NASA SP-7037 (169) of Aeronautical Engineering: A Continuing Bibliography. NASA SP-7037 and its supplements have been compiled through the cooperative efforts of the American Institute of Aeronautics and Astronautics (AIAA) and the National Aeronautics and Space Administration (NASA). This cumulative index includes subject, personal author, corporate source, contract, report number, and accession number indexes.
Author

N84-20134* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 255)
Feb. 1984 86 p
(NASA-SP-7011(255); NAS 1.21:7011(255)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 278 reports, articles and other documents introduced into the NASA scientific and technical information system in January 1984.
Author

N84-20135*# Federation of American Societies for Experimental Biology, Bethesda, Md. Life Sciences Research Office.
RESEARCH OPPORTUNITIES IN MUSCLE ATROPHY Final Report
G. J. Herbison and J. M. Talbot Jan. 1984 89 p refs
(Contract NASw-3728)
(NASA-CR-175422; NAS 1.26:175422) Avail: NTIS HC A05/MF A01 CSCL 06P

A trophy of skeletal muscle; muscle a trophy associated with manned space flight; the nature, causes, and mechanisms of muscle atrophy associated with space flight, selected physiological factors, biochemical aspects, and countermeasures are addressed.
N.W.

N84-20136# Norwegian Defence Research Establishment, Kjeller. Toxicology Div.
A STUDY ON THE GASTROINTESTINAL HORMONES AND THE GASTRIC ACID SECRETION DURING PHYSICAL STRESS IN MAN
Olav Oktedalen 15 Dec. 1983 61 p refs
(NDRE/Publ-83/1001; ISSN-0085-4301) Avail: NTIS HC A04/MF A01

The influence of physical stressors on the secretion of gastric acid and on the blood levels of gastrointestinal peptides that control the functions of the digestive process were investigated. Since peptic ulcer disease in many ways was linked to an increase in the gastric acid, the peptide levels that are know to regulate the gastric acid secretion (gastrin) were measured, and the influence of gastric acid produced (secretin, group I pepsinogins) was studied. The blood levels of gastrointestinal peptides that have possible metabolic influence (vasoactive intestinal polypeptide and human pancreatic polypeptide) were measured. For individual titles, see N84-20137 through N84-20138.

N84-20137# Norwegian Defence Research Establishment, Kjeller. Toxicology Div.
GENERAL INTRODUCTION TO THE STUDY ON THE GASTROINTESTINAL HORMONES AND THE GASTRIC ACID SECRETION DURING PHYSICAL STRESS IN MAN
Olav Oktedalen *In its* A Study on the Gastrointestinal Hormones and the Gastric Acid Secretion During Phys. Stress in Man 15 Dec. 1983 p 9-41 refs (For primary document see N84-20136 10-52)
Avail: NTIS HC A04/MF A01

The effect of prolonged physical stress and absolute fasting on the blood levels of gastrointestinal peptides and the secretion of gastric acid were studied. Especial attention was paid to peptide levels that influence, or are influenced by, the secretion of gastric acid (gastrin, secretin, pepsinogens I), or that probably have metabolic function (vasoactive intestinal polypeptide, pancreatic polypeptide). The hyperchlorhydria was not caused by the gastrin hormone, but the hypersecretion of gastric acid could account for approximately fifty per cent of the hypersecretinemia found during the stress. High plasma levels of secretin were also found during a 4 to 5 day period of absolute fasting. The high plasma levels of vasoactive intestinal polypeptide (VIP) were not influenced by the gastric acid secretion. Instead, the results indicated the VIP is a peptide of substrate need. The high fasting serum levels of human pancreatic polypeptide were modified by nutrient ingestion both during physical stress and absolute fasting.
Author

N84-20138# Norwegian Defence Research Establishment, Kjeller. Toxicology Div.
THE EFFECT OF PHYSICAL STRESS ON GASTRIC SECRETION AND PANCREATIC POLYPEPTIDE LEVELS IN MAN
Olav Oktedalen, I. Guldvog (National Hospital, Oslo), P. K. Opstad, A. Berstad (Lovisenberg Hospital, Oslo), D. Gedde-Dahl (Diakonhjemmet Hospital, Oslo), and R. Jorde (Trome Univ. Hospital) *In*

its A Study on the Gastrointestinal Hormones and the Gastric Acid Secretion During Phys. Stress in Man 15 Dec. 1983 p 91-113 refs Sponsored in cooperation with the Norwegian Military Academy and the Norwegian Joint Medical Service (For primary document see N84-20136 10-52)
Avail: NTIS HC A04/MF A01

Twelve healthy subjects were exposed to a 4-day period of hard physical exercise, calorie supply deficiency, and severe sleep deprivation. The basal acid output (BAO), the sham-feeding induced acid output MAO (sub Sh) and the pentagastrin stimulated acid output MAO (sub Pg) were measured immediately after this stress period and in a control experiment performed several weeks later. The stress induced a 3-fold increase in the median BAO, an increase ($p < 0.05$) in the MAO (sub Sh), which, however, was not significantly elevated when basal-subtracted. MAO (sub Pg) was unchanged. In contrast to acid, pepsin output was not influenced by stress. The human pancreatic polypeptide (hPP) level in serum increased 2-fold after the stress. The integrated hPP response induced by modified sham-feeding was higher ($p = 0.02$) after the stress than in the control experiment. The results show that physical stress has separate influence on the gastric secretion of acid and pepsin. Author

N84-20139# Naval Postgraduate School, Monterey, Calif.
A MATHEMATICAL MODEL FOR OXYGEN TOXICITY IN MAN M.S. Thesis
Larry Wayne Simmons Sep. 1983 68 p
(AD-A137379) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this thesis, mathematical models are established for the development of oxygen toxicity in divers. The study endeavors to derive the shape of the oxygen tolerance curve in terms of depth-time limitations by statistical analysis of existing data. By assuming a known distribution for the time-to-serious-symptom, mathematically predictive models are developed which allow a greater degree of predictability in mission profiles and allow the associated risk to divers to be evaluated. GRA

N84-20140# Army Research Inst. of Environmental Medicine, Natick, Mass.
PHYSIOLOGICAL, BIOMECHANICAL, AND MEDICAL ASPECTS OF LIFTING AND REPETITIVE LIFTING: A REVIEW
J. Knapik Nov. 1983 53 p
(DA Proj. 3E1-62777-A-845)
(AD-A136689; USARIEM-T-7/83) Avail: NTIS HC A04/MF A01 CSCL 06/19

The literature relating to physiological and medical aspects of lifting and repetitive lifting is reviewed. Studies on maximal lifting capacity and maximal acceptable lift (MAL, the amount of weight that can be lifted repetitively over an 8h period) show that as the height to which the load is lifted increases, the amount of weight lifted decreases. As lifting frequency increases, MAL decreases but power output increases. MAL of females is 50 - 70% of male values. Cardiorespiratory and metabolic studies demonstrates that VO2, HR, VE, and ratings of perceived exertion increase in a linear manner with increases in the load or frequency of lifting. The mechanical efficiency of repetitive lifting is 6-7%. MAL does not change with changes in the length or height of the load but as the load width increases, MAL decreases. VO2 and HR increase with increasing load length or width. A biomechanical model for estimation of forces and torques at various joints is presented. Compressive forces on the L5/51 spinal segment are less for the squat lift (straight back, bent knees) than the stoop lift (straight back, bent knees). The free style and stoop techniques result in lower energy expenditures and higher power outputs than the squat. GRA

N84-20141# Technology, Inc., San Antonio, Tex. Life Sciences Div.
N1 AND P1 COMPONENTS OF THE VISUAL EVOKED RESPONSE IN HUMANS. A TOPOGRAPHICAL AND FUNCTIONAL COMPARISON Final Report, 1 Jan. - 1 May 1983
F. H. Previc, D. L. Schafer, C. A. Spencer, and J. A. Chambers Nov. 1983 15 p
(Contract F33615-80-C-0610; AF Proj. 7757)
(AD-A137030; TR-118B-6183; SAM-TR-83-44) Avail: NTIS HC A02/MF A01 CSCL 06/16

The N1 and P1 components of the visual evoked response (VER) in humans were compared along several dimensions. To elicit the VER, square-wave gratings were presented in pattern-appearance/disappearance and phase-reversal stimulation modes. The gratings varied in terms of contrast, spatial and temporal frequency, and the region of the visual field in which they were presented. The results of these experiments indicated that the N1 and P1 components of the human VER possess similar functional and topographical characteristics, and may reflect a common neural origin. GRA

N84-20142# Catholic Univ. of America, Washington, D.C. Human Performance Lab.
PATTERN-DIRECTED ATTENTION IN UNCERTAIN FREQUENCY DETECTION
J. H. Howard, Jr., A. J. OToole, R. Parasuraman, and K. B. Bennett 14 Oct. 1983 41 p
(Contract N00014-79-C-0550; NR Proj. RR0-4209)
(AD-A135905; TR-83-22-ONR) Avail: NTIS HC A03/MF A01 CSCL 05/10

The role of early pattern components as cues in uncertain frequency detection was investigated in four probe-signal experiments. Listeners heard consecutive presentations of a 12-tone pattern in a noise background. One presentation of the pattern was complete whereas the other was missing the eleventh(primary) tone. Listeners were required to indicate which presentation was complete. On 20% of the test trails, the eleventh component of the complete pattern was replaced with one of four probe tones. The results indicated that listeners were more sensitive to the primary tone than to probe tones but this selective sensitivity changed on a trail-by-trail basis as a function of the attentional cues provided by early pattern components. The data suggested two cue functions: (1) an informational function in providing information regarding which primary tone is likely to occur on a given trail, and (2) a frequency function that automatically directs listening to an appropriate frequency range and narrows or fine tunes the listening band. GRA

N84-20143# Naval Aerospace Medical Research Lab., Pensacola, Fla.
ULTRASTRUCTURAL EVALUATION OF THE RETINA IN RETINOPATHY OF PREMATURITY AND CORRELATIONS WITH VITAMIN E THERAPY Interim Report
W. A. Monaco 3 Aug. 1982 21 p
(AD-A135929; NAMRL-1294) Avail: NTIS HC A02/MF A01 CSCL 06/5

Histological evidence of retinal damage associated with the clinical observation of Retinopathy of Prematurity (ROP) grade III was documented in preterm infants receiving the minimum dosage of vitamin E recommended by the American Academy of Pediatrics (5 mg/kg/day), and exposed to high concentration/duration of oxygen at birth. Matched infants that were provided a higher oral dosage of vitamin E (100 mg/kg/day) did not develop the serious grade of retinopathy (grade III) (1,2). In this paper cytological correlates are described which substantiate pre-existing theories concerning the pathological changes associated with the development of the disease at a light microscopic level. Moreover, observations made at the electromicroscopic level permit distinctions to be made concerning the newly formed retinal vessels, in treated versus non-treated infants, that have not been noted in the history of this disease. These retinal distinctions suggest that vitamin E may be efficacious in reducing the severity of ROP. Lastly, a mechanism is suggested for the action of vitamin E in reducing the severity of ROP. GRA

N84-20144# Naval Aerospace Medical Research Lab., Pensacola, Fla.
DISTRIBUTION OF VISUAL CHARACTERISTICS OF NAVAL AVIATION PERSONNEL Final Report
A. G. Baisden and W. A. Monaco 5 Aug. 1983 27 p

(NR Proj. F58-524)
(AD-A135930; NAMRL-1301) Avail: NTIS HC A03/MF A01 CSCL 06/5

Failure to meet required visual standards provides a significant source of rejections to naval aviation training and of disqualifications of designated aviators for Service Group I. It is important to assure these standards represent the visual abilities which are critical to mission performance, and to assure their proper application throughout the aviator's career. The purpose of this report is to assess the visual characteristics of stratified samples (active duty/retired) within the naval aviation community through the examination of health records, to determine the distribution of those characteristics, and to identify those characteristics that have been noted to change during the course of the naval aviator's career. The findings, based on an examination of 72 health records, show that with increasing age there are decreases in visual acuity and accommodative amplitude, increases in against-the-rule astigmatism and myopia, and stability in fusion-related variables and intraocular pressure. GRA

N84-20145# Colorado Univ., Denver. Health Sciences Center.
VENTILATION AND VENTILATORY CONTROL IN HIGH ALTITUDE PULMONARY EDEMA AND ACUTE MOUNTAIN SICKNESS Final Report, Jul. 1981 - Oct. 1982
J. T. Reeves Apr. 1983 15 p
(Contract DAMD17-81-C-1057; DA Proj. 3E1-62777-A-879)
(AD-A135941) Avail: NTIS HC A02/MF A01 CSCL 06/5

When the 12 subjects were taken from low altitude (1600M in Denver, CO) to high altitude (4300M on Pike's Peak) they underwent acclimatization over 5 days. The surprising finding was that on day 4 and day 5 their ventilations were predicted by the acute isocapnic hypoxic response at low altitude. It was as though, after acclimatization, the relatively pure response to acute hypoxia was a major determinant of ventilation. On arrival at high altitude (Pike's Peak day 1) the ventilation showed only a small increase above the Denver value, as though the response to hypoxia were inhibited. Total ventilaltion, however, was not the most sensitive measure of acclimatization because we found it was influenced by metabolic increases at rest and dead space increases during exercise.. A more sensitive measure and one that provided useful inter-individual comparisons involved the use of an SaO2-PCO2 stimulus response curve, similar to that proposed by Rahn and Otis. Examination of these curves in relation to high altitude values suggested that it was hypoxic depression at high altitude that was responsible for the poor ventilatory response and the development of symptoms in some individuals at high altitude. GRA

N84-20146# Army Research Inst. of Environmental Medicine, Natick, Mass.
HEAT EXCHANGE DURING UPPER AND LOWER BODY EXERCISE
M. N. Sawka, R. R. Gonzalez, L. L. Drolet, and K. B. Pandolf Nov. 1983 24 p
(DA Proj. 3E1-62777-A-879)
(AD-A136015; USARIEM-M-6/84) Avail: NTIS HC A02/MF A01 CSCL 06/19

This study examined evaporative and dry heat exchange during upper and lower body exercise. Four male subjects performed arm crank (AC) or cycle (CY) exercise at the same oxygen uptake (approx 1.6 1/min) in an environment facilitating dry (R + C) heat exchange (18 C, rh = 78%), and an environment facilitating evaporate (Esk) heat loss (35 C, rh = 28%), both having a equal dew point temperature (14 C). R + C was determined from the torso with a net radiometer and from the limbs with heat flow discs; whereas, Esk was determined from the torso and limbs by dew-point hygrometry. In both environments, neither esophgeal temperature nor mean skin temperature were different between exercise types ($P>0.05$). Torso R + C was significantly ($P< 0.05$) greater during AC than CY exercise in both environments. Torso Esk, as well as arm R + C and arm Esk were not different ($p>0.05$) between exercise type in each environment. Leg R + C was greater ($P>0.05$) during CY and AC exercise in the 18 C environment, whereas, leg Esk was greater ($p<0.05$) during CY and AC exercise in the 35 C environment. These data indicate that to compensate for greater torso sensible heat loss during upper body exercise, lower body exercise elicits additional R + C or Esk from the legs. The avenue for this compensatory sensible and insensible heat loss depends upon the differential heat transfer coefficients. GRA

N84-20147# New York Univ., New York.
NEUROMAGNETIC INVESTIGATION OF WORKLOAD AND ATTENTION Interim Technical Report, 1 Jan. - 31 Dec. 1982
L. Kaufman and S. J. Williamson 23 Apr. 1983 5 p
(Contract F49620-82-K-0014; AF Proj. 2313)
(AD-A136172; AFOSR-83-0901TR) Avail: NTIS HC A02/MF A01 CSCL 05/10

Progress was made in the areas of instrumention and techniques, and experiment on the auditory and visual neuromagnetic counterpart to the P300 complex, and in formulating new approaches to the study of brain activity related to workload and attention. A new system (MAGSCAN), used to hold a multisensor array of SCUID's and gradiometers was designed and is under construction. MAGSCAN will make possible the rapid measurement of the field normal to the scalp, and thereby allow an efficient and cost-effective construction of field maps that are needed for locating sources of neuromagnetic fields. This system will minimize effects of long-term changes in the state of a subject in the course of an experiment. Also, several computer programs were developed to implement experiments and provide a more sophisticated level of data analysis. R.J.F.

N84-20148# Professional Staff Association of the Rancho Los Amigos Hospital, Inc., Downey, Calif.
SHORT-TERM HUMAN RESPIRATORY EFFECTS OF NITROGEN DIOXIDE: DETERMINATION OF QUANTITATIVE DOSE-RESPONSE PROFILES. PHASE 1: EXPOSURE OF HEALTHY VOLUNTEERS TO 4 PPM NO/SUB 2 Final Report
William S. Linn and Jack D. Hackney 10 Jun. 1983 35 p refs
(PB84-132299; CRC-APRAC-CAPM-48-83) Avail: NTIS HC A03/MF A01 CSCL 06T

Twenty-five healthy volunteers were exposed twice to purified air (control) and to 4 ppm NO2 (exposure) for periods of one hour, fifteen minutes, including light and heavy bicycle exercise (fifteen minutes each). No statistically significant effects of NO2 on airway resistance, symptoms, heart rate, skin conductance, or self-reported emotional states were found. Systolic blood pressure showed a statistically significant difference between NO2 exposure and control: a decrease with NO2 of about 2 mm Hg. the lack of effect on airway resistance contrasts with published results from other laboratories. The health significance of the blood-pressure effect, if any, is unknown. Author (GRA)

N84-20149 University of Northern Colorado, Greeley.
THE EFFECT OF AEROBIC CAPACITY ON VO2 MAX VALUES MEASURED DURING LEG ERGOMETRY AND COMBINED ARM AND LEG ERGOMETRY Ph.D. Thesis
Richard Joseph Sabath, III 1983 121 p
Avail: Univ. Microfilms Order No. DA8328509

The effect of aerobic capacity on VO2 max values measured during leg ergometry and combined arm-leg ergometry was examined. Thirty-six males, ages 18 to 31 years were divided into two groups on the basis of their VO2 max values. Each subject performed three VO2 max tests, two leg tests on a cycle ergometer and one combined test of arm cranking and leg pedaling. A two way ANOVA, corrected for repeated measures suggests a significant relationship between the level of aerobic capacity, the amount of muscle mass activated, and the VO2 max values recorded. Less fit subjects demonstrated a significantly VO2 max in tests of arm-leg ergometry as compared to leg only ergometry. Subjects with higher aerobic capacities failed to demonstrate similar differences. Dissert. Abstr.

N84-20150 Miami Univ., Coral Gables, Fla.
EFFECT OF INSPIRATORY MUSCLE FATIGUE ON PERCEPTION OF ADDED LOADS IN HUMANS Ph.D. Thesis

William Robert Revelette 1983 62 p
Avail: Univ. Microfilms Order No. DA8328440

Studies have indicated that muscle fatigue alters the perception of added loads, and suggest that the primary source of load magnitude information is supplied by motor command signals. The effect that both adaptation to an extreme load and muscle fatigue had on the perception of inspiratory resistive loads was investigated. Effects on either threshold detection (TD) or magnitude estimation (ME) of added resistive loads were assessed following a two minute exposure to a very high resistive load and after inspiratory muscle fatigue. A third study, designed to parallel the resistive load ME experiment, involved estimation of weights lifted in the hand. Perceptual performance was assessed for the TD study using the Weber fraction based on mouth pressure. The exponent for Stevens' power law was used in the ME studies as a measure of performance. There was no significant difference in the Weber fractions for any condition. Dissert. Abstr.

N84-20151 Louisiana State Univ., New Orleans.
THE EFFECTS OF HIGH FREQUENCY POSITIVE PRESSURE VENTILATION ON HYPOXIC PULMONARY VASOCONSTRICTION Ph.D. Thesis
Stanley Martin Hall 1983 96 p
Avail: Univ. Microfilms Order No. DA8324424

The effects of two modes of ventilation on the distribution of blood flow in the lung were compared. High frequency positive pressure ventilation is compared to a method of ventilation more commonly used clinically, intermittent positive pressure ventilation. Eighteen dogs had electromagnetic flow probes chronically implanted on their main (QT) and left (QL) pulmonary arteries. Catheters were placed in their left atria, and temoral and pulmonary arteries. They were ventilated via Cartens dual lumen endotracheal tubes inserted through trachaostomies, separating ventilation of the left and right lungs. Experiments were performed on three groups of these closed chest animals. (1) in the first group of experiments (N = 7), the fraction of the cardiac output perfusing the left lung (QL/QT) was determined during bilateral ventilation and during ventilation of the right lung while the left lung was collapsed. Ventilation was maintained with eithe a Harvard respirator or an Emerson airway vibrator. Dissert. Abstr.

N84-20152 South Dakota State Univ., Brookings.
METABOLIC CHARACTERISTICS OF POST-EXERCISE KETOSIS: THE PROTECTIVE EFFECTS OF TRAINING Ph.D. Thesis
Mark A. Beattie 1983 182 p
Avail: Univ. Microfilms Order No. DA8325021

The metabolic characteristics of post-exercise ketosis was determined. Experiments dealing with both the trained and nontrained states in order to determine the trained induced adaptations which account for the differences seen in the two conditions are included. Trained and untrained rats were fasted overnight and then exercised for 90 minutes. Both groups began exercise with severly depleted liver glycogen stores, but only the untrained rats showed high levels of blood 3-oxybutyrates in the post-exercise period. Hepatic maionyl CoA levels were similar in the two groups at all points. Plasma free fatty acid and hepatic carnitine concentrations indicated that ketogenesis was proceeding at higher rates in untrained animals. Trained and untrained rats were also restricted to 18 g of food on the night before a 90 minute exercise bout. Rats fed ad lib were also exercised. Dissert. Abstr.

N84-20153 Ball State Univ., Muncie, Ind.
EFFECTS OF DIETARY SODIUM INTAKE ON BODY AND MUSCLE POTASSIUM CONTENT IN UNACCLIMATIZED MEN DURING SUCCESSIVE DAYS OF WORK IN THE HEAT Ph.D. Thesis
Lawrence Edward Armstrong 1983 113 p
Avail: Univ. Microfilms Order No. DA8327870

The influence of two levels of dietary sodium (Na+) intake on intramuscular and extracellular potassium (K-) content was examined. Nine unacclimatized college males exercised (90 minutes of treadmill walking, 5.6km/hr, 6% grade) in an environmental chamber maintained at 40.1 + or - .05 C and 23.5 + or - .4%RH, during two 8 day dietary acclimation regimens. The first regimen employed a high Na+ diet (399mEq/day), the second a low Na+diet (98mEq/day); both diets contained 80mEq K-/day. Total body K+ stores increased during the high Na+ diet (+138mEq, 4.1%) and the low Na+diet (+114mEq, 3.4%). By day 8 (D8) of both treatments, subjects exhibited a significantly lower ($p<.05$) mean heart rate and rectal temperature. Oxygen consumption and sweat rate were unaltered but sweat responsiveness (mi/hr/C) progressively increased during the acclimation trials. Dissert. Abstr.

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-20154*# Maryland Univ., College Park. Remote Sensing Systems Lab.
REMOTE SENSING TRAINING FOR CORPS OF ENGINEERING PERSONNEL: THE UNIVERSITY TRAINING MODULE CONCEPT Final Report, Jul. 1981 - Jul. 1982
Aug. 1982 34 p refs Sponsored in part by Corps of Engineers (Contract NAS5-26650)
(NASA-CR-175204; NAS 1.26:175204) Avail: NTIS HC A03/MF A01 CSCL 05I

A concept to permit Corps of Engineers personnel to obtain and maintain an appropriate level of individual proficiency in the application of remote sensing to water resource management is described. Recommendations are made for specific training courses and include structure and staffing requirements, syllabi and methods of operation, supporting materials, and procedures for integrating information systems management into the University Training Modules. Author

N84-20155*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EVALUATION OF RIDE QUALITY PREDICTION METHODS FOR HELICOPTER INTERIOR NOISE AND VIBRATION ENVIRONMENTS
Jack D. Leatherwood, Sherman A. Clevenson, and Daniel D. Hollenbaugh (USAAVSCOM Research and Technology Labs.) Mar. 1984 47 p refs
(DA Proj. 1L2-62209-AH-76)
(NASA-TP-2261; L-15661; NAS 1.60:2261; AVSCOM-TR-84-D-2)
Avail: NTIS HC A03/MF A01 CSCL 05H

The results of a simulator study conducted to compare and validate various ride quality prediction methods for use in assessing passenger/crew ride comfort within helicopters are presented. Included are results quantifying 35 helicopter pilots discomfort responses to helicopter interior noise and vibration typical of routine flights, assessment of various ride quality metrics including the NASA ride comfort model, and examination of possible criteria approaches. Results of the study indicated that crew discomfort results from a complex interaction between vibration and interior noise. Overall measures such as weighted or unweighted root-mean-square acceleration level and A-weighted noise level were not good predictors of discomfort. Accurate prediction required a metric incorporating the interactive effects of both noise and vibration. The best metric for predicting crew comfort to the combined noise and vibration environment was the NASA discomfort index. Author

N84-20156# Naval Training Equipment Center, Orlando, Fla.
PART-TASK TRAINING STRATEGIES IN SIMULATED CARRIER LANDING FINAL APPROACH TRAINING Final Report, 1 Mar. 1982 - 30 Apr. 1983
D. C. Wightman Nov. 1983 75 p
(AD-A136670; NAVTRAEQUIPC-IH-347) Avail: NTIS HC A04/MF A01 CSCL 05/9

This experiment manipulated task simplification variables of lag and approach length in order to examine their influence on training of the perceptual motor skills of a simulated carrier landing in the transfer of a training experiment. In addition, the subject's level of motor skills was assessed as a means of controlling for individual differences and testing for any interactions that might exist between the training strategies and the subject's aptitude. Strong transfer effects were found for both motor-skill levels and the segmentation technique, while lag manipulation produced no main effects. Several interactions of the aptitude by treatment type between subject's motor-skill levels and training manipulation were discovered. The results suggest that low-motor-skill subjects are unable to adapt to changes presented during training and are unable to break bad habits acquired during the course of training. GRA

N84-20157# Michigan State Univ., East Lansing.
PERFORMANCE FEEDBACK EFFECTS UNDER VARYING CONDITIONS OF GOALS, FEEDBACK TYPE, AND CHOICE Interim Technical Report
D. R. Ilgen and C. F. Moore Dec. 1983 47 p Prepared in cooperation with Purdue Univ., Lafayette, Ind.
(Contract N00014-83-K-0756)
(AD-A136703; TR-83-6; Rept-2002) Avail: NTIS HC A03/MF A01 CSCL 05/10

Three studies were conducted to investigate the effects of goal setting and feedback on quality and quantity performance dimensions of a task. The purpose of the research was to: (1) demonstrate the interactive effect of goals and feedback on performance, (2) investigate the effects of different types of feedback on motivation and learning in the presence of goals, and (3) explore the effects on motivation, learning and performance variables on allowing individuals the freedom to choose to receive feedback. In all three experiments, subjects used a microcomputer to respond to a proofreading task. The results indicated that goal setting and feedback do interact to affect performance and that the cognitive processes involved in the interaction are more likely to be strategy-oriented rather than motivational. Author (GRA)

N84-20158# Naval Postgraduate School, Monterey, Calif.
THE EFFECT OF NOISE AND DISPLAY ORIENTATION ON COGNITIVE PERFORMANCE M.S. Thesis
S. H. Choi Sep. 1983 57 p
(AD-A136808; AD-E301284) Avail: NTIS HC A04/MF A01 CSCL 05/10

Military personnel encounter a variety of noise environments. During exercises, high intensity noise levels are often encountered. 24 subjects were required to respond to symbols presented under two levels of task difficulty, two levels of presentation rate, two levels of display orientation, and three levels of noise intensity. The purpose of the experiment was to determine whether noise intensity and display orientation had any effect on short-term memory task. Results showed that continuous white noise at intensity levels of 30, 85, and 105 dB had no effect on the short-term memory task. Presentation rate and task difficulty demonstrated a significant relationship with task performance as did their two-way interaction. This two-way interaction between presentation rate and task difficulty exhibited a different pattern for the two levels display orientation. GRA

N84-20159# Perceptronics, Inc., Woodland Hills, Calif.
MENTAL REPRESENTATION OF CIRCUIT DIAGRAMS: INDIVIDUAL DIFFERENCES IN PROCEDURAL KNOWLEDGE Annual Report
R. E. Geiselman, M. G. Samet, and T. D. Wickens Dec. 1983 60 p
(Contract N00014-81-C-0590)
(AD-A136876; PATR-1109-83-12) Avail: NTIS HC A04/MF A01 CSCL 05/10

This work is concerned with the knowledge that electronics technicians possess of electronic equipment, and more generally, with how people operate in tasks that draw upon a complex spatial symbolic knowledge base. A technician's knowledge base is postulated to consist of three types of related knowledge: structural/functional knowledge, which pertains to the actual configuration of a circuit and the role that its components play in the operation of the device; prototypical knowledge, which pertains to the general properties common to circuits of a given type; and procedural knowledge, which pertains to the way that a circuit can be modified and to the interaction among knowledge elements of all three types of knowledge. The present report focuses on an experiment conducted to investigate individual differences in procedural knowledge. Novice and expert subjects performed tasks in which they had to either locate and correct an error in a circuit, change the function of a circuit, or complete a missing segment in a circuit. On all tasks, experts were found to be far more accurate than novices; but more important, experts were classified, on the basis of verbal protocols, to be considerably more systematic, orderly and directed in their problem solving strategies. The productive procedures used by experts were then translated into specific guidelines toward improving circuit troubleshooting, and the effectiveness of these guidelines will be evaluated in a subsequent experiment. The results of this research program should help in providing guidelines for training electronic technicians to better understand and troubleshoot complex equipment. GRA

N84-20160# Seville Training Systems Corp., Pensacola, Fla.
PROCESSES OF SKILL PERFORMANCE: A FOUNDATION FOR THE DESIGN AND USE OF TRAINING EQUIPMENT Final Report, Jun. 1978 - Jul. 1982
W. D. Spears Nov. 1983 172 p
(Contract N61339-78-C-0113)
(AD-A136879; SEVILLE-TR-82-06; NAVTRAEQUIPC-78-C-0113-4) Avail: NTIS HC A08/MF A01 CSCL 05/9

The purpose was to lay a foundation for the design of low-cost training devices through an analysis of skill performance. Cognitive motor skills are analyzed in terms of the processing of information. Cognitive processes involved in both types of skills include task recognition; task comprehension; goal setting; planning performance; initiating, monitoring, and regulating performance; stimulus encoding and elaboration; attentional processes; retention and retrieval of information; hierarchical schemata for discrimination and generalization; motivation; and skill integration and automatization. For motor skills, special attention is given to structural characteristics of movements; temporal characteristics of movements; signal discrimination and generalization; roles of sensory modes and their interactions; and patterns of skill integration. Empirically based concepts are used throughout to provide an operational means of manipulating variables during training, and examples are given of methods for empirically assessing the roles of various processes. It is concluded that the analyses could be readily extrapolated to a training technology in general and to the design of training devices in particular. Selected research topics illustrate what could be involved in the extrapolation.Author (GRA)

N84-20161# Duke Univ., Durham, N. C.
EFFORT AND ACCURACY IN CHOICE
E. J. Johnson and J. W. Payne Jan. 1984 60 p
(Contract N00014-80-C-0114)
(AD-A136881; 84-1) Avail: NTIS HC A04/MF A01 CSCL 05/1

Individuals often use several different strategies such as the expected value rule, conjunctive rule, and elimination-by-aspects, to make decisions. It has been hypothesized that strategy selection is, in part, a function of the ability of a strategy to produce an accurate response and the strategy's demand for mental resources or effort. We examine effort and accuracy and their role in strategy selection. Several strategies that may be used to make choices under risk are simulated using a production system framework. This framework allows the estimation of the effort required to use the strategy in a choice environment, while simultaneously measuring its accuracy relative to a normative model. A series of Monte-Carlo studies varied several aspects of the choice environments, including the complexity of the task and the presence or absence of dominated alternatives. These simulations identify strategies which approximate the accuracy of normative procedures while requiring substantially less effort. These

results, however, are highly contingent upon characteristics the task environment. Finally, we discuss the potential of production system models in understanding task effects in decisions and the learning of effort/accuracy tradeoffs. Author (GRA)

N84-20162# Chicago Univ., Ill. Center for Decision Research.
LEARNING IN A PROBABILISTIC ENVIRONMENT: A NEW APPROACH, AND SOME PRELIMINARY FINDINGS
J. Klayman May 1983 29 p Presented at the Meeting of the Midwest. Psychol. Assoc., Chicago, May 1983
(Contract N00014-81-K-0314)
(AD-A137031; TR-7) Avail: NTIS HC A03/MF A01 CSCL 05/10

Many studies of 'probability learning' have led to the conclusion that human learners cannot find the 'rule' amidst the 'noise' (Brehmer, 1980). It is hypothesized that under more natural conditions, learners do develop rules which are probabilistically predictive, and improve chiefly through the addition of new predictive variables. The present study represents natural learning situations by including: instructions and rewards that emphasize gradual development of understanding, rather than discovery of the right rule; and a large number of cues, which must be discovered, rather than a few cues explicitly given. Results with 12 college-student subjects indicate significant learning in a computer-displayed task, over approximately 10 hours of experience. Learning was incremental, and was accompanied by the addition of valid factors to existing rules. These results contrast with findings that people fail to utilize information effectively in probabilistic situations. Earlier studies do not, however, model situations in which learning requires the discovery and validation of predictive cues, processes critical for the development of real-world expertise. GRA

N84-20163# Chicago Univ., Ill. Center for Decision Research.
A THEORY OF DIAGNOSTIC INFERENCE Final Report
H. J. Einhorn and R. M. Hogarth Nov. 1983 36 p
(Contract N00014-81-K-0314)
(AD-A137032; TR-8) Avail: NTIS HC A03/MF A01 CSCL 05/10

The essential aspects of diagnostic inference are that they are causal rather than correlational, backward rather than forward (one goes from effects to prior causes), concerned with a specific rather than the general case, and constructive (one can synthesize, enlarge, or otherwise develop new hypotheses). We have developed and tested models of two aspects of diagnostic inference: judgments of the causal strength of a hypothesis/explanation, and how probabilistic assessments concerning the occurrence of a past event are made on the basis of (often conflicting) evidence received from less than perfectly reliable sources. The psychological rationales, quantitative formulations, and implications of these models are presented in this report together with a description of various experiments designed to test the models. We also discuss several commonalities between the two lines of research: the use of cognitive anchoring-and-adjustment strategies to cope with complex inference tasks; the constructive nature of diagnosis; the importance of surprise in inference; and the relation of the present work to normative standards of judgment and choice. GRA

N84-20164# Washington Univ., Seattle. Dept. of Psychology.
SELF-MONITORING. COGNITIVE PROCESSES AND PERFORMANCE
I. G. Sarason and E. H. Potter, III 12 Dec. 1983 30 p
(Contract N00014-80-C-0522)
(AD-A137043; CO-ONR-009) Avail: NTIS HC A03/MF A01 CSCL 05/10

The findings of two laboratory experiments and three field studies conducted at the U.S. Coast Guard Academy dealing with the effects of self-monitoring are reported. The laboratory studies showed a significant relationship between self-monitoring, task persistence, and cognitive interference. The field studies showed significant differences between positive and negative self-monitoring with regard to how new Coast Guard Academy cadets respond to entry into a complex, stress-arousing organizational setting. The five studies reveal that positive self-monitoring has a salutary effect on performance, cognitive interference, and self evaluation. The research suggests that both psychological theory and organizational effectiveness might be significantly advanced with an increase in knowledge about how people deal with self-related attentional cues. Author (GRA)

N84-20165# Yale Univ., New Haven, Conn. School of Organization and Management.
A NORMATIVE MODEL OF WORK TEAM EFFECTIVENESS Interim Report
J. R. Hackman Nov. 1983 74 p
(Contract N00014-80-C-0555)
(AD-A136398; AD-E000556; SOM-TR-2) Avail: NTIS HC A04/MF A01 CSCL 05/1

Descriptive research on group performance has produced neither a set of empirical generalizations sturdy enough to guide the design and management of work teams, nor interventions that reliably improve team effectiveness. As an alternative, a normative model of group effectiveness is proposed and discussed. The model identifies potentially manipulable aspects of the group and its context that are particularly potent in promoting team effectiveness, and organizes those factors to make them useful in diagnosing the strengths and weaknesses of task-performing teams. The final section of the paper explores the implications of the normative model, and outlines the beginnings of an action model for creating and maintaining effective work groups in organizations. Author (GRA)

N84-20166# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
TOWARD AN INTERPERSONAL PARADIGM FOR SUPERIOR-SUBORDINATE COMMUNICATION Ph.D. Thesis
T. L. Bangs Nov. 1983 205 p
(AD-A135863; AFIT/CI/NR-83-77D) Avail: NTIS HC A10/MF A01 CSCL 05/10

The purpose of this dissertation is to report formulative research on an interpersonal paradigm for superior-subordinate communication. The suggested paradigm goes beyond traditional structural approaches to leadership and rests on the interpersonal perception theory of Laing, Phillipson, and Lee. The following theoretical propositions were tested: (1) Highly confirming behavior by a superior, as perceived by an immediate subordinate, is related to a high degree of subordinate feedback. (2) Highly confirming behavior by a superior, as that behavior is perceived by a subordinate, is related to greater communication of creativity from the subordinate to the superior. (3) High superior disclosure, as perceived by a subordinate, is related to a high degree of subordinate feedback. (4) A high degree of superior accessibility, as perceived by a subordinate, is related to greater communication of creativity from the subordinate to the superior. (5) A high degree of superior accessibility, as perceived by a subordinate, is related to a high degree of subordinate feedback. GRA

N84-20167# Yale Univ., New Haven, Conn. School of Organization and Management.
AN INTERGROUP PERSPECTIVE ON GROUP DYNAMICS Interim Report
C. P. Alderfer Oct. 1983 94 p
(Contract N00014-82-K-0715)
(AD-A135582; SOM-WP-57) Avail: NTIS HC A05/MF A01 CSCL 05/10

Intergroup perspectives began to shape the understanding of human behavior from the beginning of the twentieth century. Intergroup theory provides interpretations for individual, interpersonal, group, intergroup, and organizational relations. The version of intergroup theory given here uses a definition of group that is concerned with both internal and external properties. It explains intergroup dynamics in terms of group boundaries, power, affect, cognition, and leadership behavior. It examines the nature of identity and organization groups. It relates the state of intergroup relations to the suprasystem in which they are embedded. It presents an understanding of the changing relations among interdependent groups and their representatives through the operation of parallel

and unconscious processes. The theory relates to a wide array of social and organizational problems, including the development of effective work teams, the definition and management of organizational culture, and the teaching of organizational behavior in Management schools. GRA

N84-20168# Instructional Science and Development, Inc., San Diego, Calif.
AUTOMATED INSTRUCTIONAL MEDIA SELECTION (AIMS)
H. D. Kribs, A. C. Simpson, and L. J. Mark Oct. 1983 110 p
(Contract N61339-79-C-0104; NR Proj. 871-1)
(AD-A135749; NAVTRAEQUIPC-79-C-0104-1) Avail: NTIS HC A06/MF A01 CSCL 05/9

As part of an overall automated aids to instructional systems development project, the Automated Instructional Media Selection (AIMS) model was developed. The model was designed to be flexible and widely applicable. It allows the user to define the media pool of up to 90 potential media, and 90 instructional characteristics. All aspects of the media pool are updatable. A user's guide is included for using the system. Author (GRA)

N84-20169# Mathetics, Inc., San Diego, Calif.
PILOT BEHAVIOR MODELS FOR LSO (LANDING SIGNAL OFFICER) TRAINING SYSTEMS Final Report, 30 Jun. 1980 - 30 Oct. 1981
J. T. Hooks and W. S. McMurry Oct. 1983 235 p
(Contract N61339-80-C-0063)
(AD-A135823; NAVTRAEQUIPC-80-C-0063-2) Avail: NTIS HC A11/MF A01 CSCL 05/9

This report promulgates results of a project to develop pilot/aircraft behavior models for an automated LSO training system. Data supporting the identification of critical LSO task conditions were collected through literature search, accident report review and survey of the LSO community. Results of data collection and their implications to model development are presented. Pilot/aircraft models, a listing of key LSO learning concepts and a functional design for the models are included. An extensive bibliography is also included. Author (GRA)

N84-20170# Naval Aerospace Medical Research Lab., Pensacola, Fla.
PERFORMANCE CONSISTENCY ON A PERCEPTUAL-MOTOR TASK AS A CORRELATE OF ACHIEVEMENT MOTIVATION
G. B. Thomas and R. W. Clipper 17 Jun. 1983 29 p
(NR Proj. F58-528)
(AD-A135933; NAMRL-1299) Avail: NTIS HC A03/MF A01 CSCL 05/10

A series of studies involving Student Naval Aviators, Naval Flight Officers and Aviation Officer Candidates was conducted to determine whether consistency of performance on a perceptual-motor task was related in any way to scores on traditional pencil-and-paper tests of achievement motivation. The results indicated that a particular choice RT paradigm repeatedly resulted in correlations of 0.43 to 0.69 ($p < 0.05$) between performance consistency and TAT-based measures of achievement motivation and that the test-retest reliability of the consistency measure was on the order of 0.70. No other relationships appeared repeatedly throughout the five studies. A very limited validation study relating relevant measures with the ultimate performance consistency measure might be a useful supplement to existing selection tests in predicting success in flight training. It is recommended that additional research be conducted to replicate and refine the RT consistency measure with the ultimate goal being an objective measure of achievement motivation. GRA

N84-20171# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ACCURACY OF VISUALLY PERCEIVED ROLL ANGLE AND ROLL RATE USING AN ARTIFICIAL HORIZON AND PERIPHERAL DISPLAYS
R. J. A. W. Hosman and J. C. vanderVaart Mar. 1983 24 p refs Presented at 2nd European Ann. Conf. on Human Decision Making and Manual Control, Bonn, 2-4 Jun. 1982
(VTH-LR-377) Avail: NTIS HC A02/MF A01

In computer controlled ground tests, jet transport pilots were required to make accurate and fast estimates of roll attitude or roll rate presented at short intervals on a central cathode ray tube display (artificial horizon). The influence of exposure time and, in the case of the roll rate perception task, the influence of the presence of displays in the peripheral field of vision, were investigated. Results show that roll attitude perception is more accurate and can be accomplished at much shorter exposure times than roll rate perception. Reaction time for roll attitude perception is 0.1 sec shorter than for roll rate perception using the central display. Peripheral displays improve roll rate perception and decrease reaction time. Author (ESA)

N84-20172# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
PSYCHOLOGICAL RESEARCH IN USA WITHIN THE AREAS OF ANTI-TANK HELICOPTER OPERATIONS AND MAN-COMPUTER INTERACTIONS: STUDY TRIP TO USA, MAY-JUNE 1983
Hans Marmolin and Anders Carlstroem Nov. 1983 31 p refs In SWEDISH; ENGLISH summary
(FOA-C-53012-H2; ISSN-0347-7665) Avail: NTIS HC A03/MF A01

Selection and training of pilots, cooperation between pilot and gunner and the use of training simulators are discussed.
Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-20173# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
VIBRATION EXPOSURES CONCERNING THE DRIVERS OF TRUCKS AND VEHICLES OPERATED BY RODOTIGRE
L. X. Nepomuceno 11 Oct. 1983 31 p In PORTUGUESE; ENGLISH summary
Avail: NTIS HC A03/MF A01

The results of the vibration levels in third octave bands, related to the exposure the drivers of vehicles suffer are presented. The results comprise various types of pavements in different roads, from asphalt to totally untreated roads. The results indicate some limited time for driving, according to the type of pavement on the different roads, as the drivers are normally on the wheel during eight hours daily. Author

N84-20174*# Nelson and Johnson Engineering, Inc., Boulder, Colo.
THE HISTORICAL DEVELOPMENT AND BASIS OF HUMAN FACTORS GUIDELINES FOR AUTOMATED SYSTEMS IN AERONAUTICAL OPERATIONS
J. A. Ciciora, S. D. Leonard, N. Johnson, and John Amell Feb. 1984 403 p
(Contract NAS2-11523)
(NASA-CR-166560; NAS 1.26:166560) Avail: NTIS HC A18/MF A01 CSCL 05H

In order to derive general design guidelines for automated systems a study was conducted on the utilization and acceptance of existing automated systems as currently employed in several commercial fields. Four principal study area were investigated by means of structured interviews, and in some cases questionnaires. The study areas were aviation, a both scheduled airline and general commercial aviation; process control and factory applications; office automation; and automation in the power industry. The results of over eighty structured interviews were analyzed and responses categoried as various human factors issues for use by both designers and users of automated equipment. These guidelines address such items as general physical features of automated

equipment; personnel orientation, acceptance, and training; and both personnel and system reliability. Author

N84-20175*# Stanford Univ., Calif.
PRECISE CONTROL OF FLEXIBLE MANIPULATORS Semiannual Progress Report
Robert H. Cannon, Jr. Mar. 1984 36 p refs
(Grant NAG1-322)
(NASA-CR-175389; NAS 1.26:175389) Avail: NTIS HC A03/MF A01 CSCL 05H

Experimental apparatus were developed for physically testing control systems for pointing flexible structures, such as limber spacecraft, for the case that control actuators cannot be collocated with sensors. Structural damping ratios are less than 0.003, each basic configuration of sensor/actuator noncollocation is available, and inertias can be halved or doubled abruptly during control maneuvers, thereby imposing, in particular, a sudden reversal in the plant's pole-zero sequence. First experimental results are presented, including stable control with both collocation and noncollocation. Author

N84-20176*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN EXPERIMENTAL EVALUATION OF THE STERNBERG TASK AS A WORKLOAD METRIC FOR HELICOPTER FLIGHT HANDLING QUALITIES (FHQ) RESEARCH
John C. Hemingway Mar. 1984 39 p refs
(NASA-TM-85884; A-9634; NAS 1.15:85884) Avail: NTIS HC A03/MF A01 CSCL 05H

The objective was to determine whether the Sternberg item-recognition task, employed as a secondary task measure of spare mental capacity for flight handling qualities (FHQ) simulation research, could help to differentiate between different flight-control conditions. FHQ evaluations were conducted on the Vertical Motion Simulator at Ames Research Center to investigate different primary flight-control configurations, and selected stability and control augmentation levels for helicopters engaged in low-level flight regimes. The Sternberg task was superimposed upon the primary flight-control task in a balanced experimental design. The results of parametric statistical analysis of Sternberg secondary task data failed to support the continued use of this task as a measure of pilot workload. In addition to the secondary task, subjects provided Cooper-Harper pilot ratings (CHPR) and responded to workload questionnaire. The CHPR data also failed to provide reliable statistical discrimination between FHQ treatment conditions; some insight into the behavior of the secondary task was gained from the workload questionnaire data. Author

N84-20177*# Hamilton Standard, Windsor Locks, Conn.
PREPROTOTYPE SAWD SUBSYSTEM Final Report
T. A. Nalette Feb. 1984 124 p
(Contract NAS9-13624)
(NASA-CR-171760; NAS 1.26:171760; SVHSER-8921) Avail: NTIS HC A06/MF A01 CSCL 06K

A regenerable, three man preprototype solid amine, water desorbed (SAWD) CO2 removal and concentation subsystem was designed, fabricated, and successfully acceptance tested by Hamilton Standard. The preprototype SAWD incorporates a single solid amine canister to perform the CO2 removal function, an accumulator to provide the CO2 storage and delivery function, and a microprocessor which automatically controls the subsystem sequential operation and performance. The SAWD subsystem was configured to have a CO2 removal and CO2 delivery capability at the rate of 0.12 kg/hr (0.264 lb/hr) over the relative humidity range of 35 to 70%. The controller was developed to provide fully automatic control over the relative humidity range via custom software that was generated specifically for the SAWD subsystem. The preprototype SAWD subsystem demonstrated a total of 281 hours (208) cycles of operation during ten acceptance tests that were conducted over the 3 to 70% relative humidity range. This operation was comprised of 178 hours (128 cycles) in the CO2 overboard mode and 103 hours (80 cycles) in the CO2 reduction mode. The average CO2 removal/delivery rate met or exceeded the design specification rate of 0.12 kg/hr (0.254 lb/hr) for all ten of the acceptance tests. Author

N84-20178# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
DEVELOPMENT OF A PRESSURIZED ANTI-EXPOSURE BARRIER SYSTEM Interim Report, Oct. 1981 - May 1983
Jules Z. Lewyckyj 1 May 1983 77 p
(AD-A137130; NADC-83055-60) Avail: NTIS HC A05/MF A01 CSCL 06/17

A protective foam barrier was conceived to serve as a normal flight garment to enhance flame resistance, reduce adverse thermal conduction, and provide flotation during emergency conditions. Preliminary studies investigated feasibility of utilizing pressurized foam between two layers of cloth to envelop the wearer's torso and limbs. GRA

N84-20179# Naval Submarine Medical Center, Groton, Conn.
STANDARDS FOR PROTECTIVE GOGGLES FOR USE IN THE COLD Final Report
S. M. Luria 21 Dec. 1983 12 p
(DA Proj. M00-95)
(AD-A137288; NSMRL-1014) Avail: NTIS HC A02/MF A01 CSCL 06/17

The characteristics of goggles needed to protect the eyes in cold environments are specified, based on laboratory investigations, field studies, and a survey of the literature. The transmittance of the filters, the magnitude of distortion, the degree of chromaticity, resistance to fogging, and the physical standards of the filters are considered. GRA

N84-20180# Human Engineering Labs., Aberdeen Proving Ground, Md.
MISSILE COMPONENT REPAIR WHILE WEARING NBC PROTECTIVE CLOTHING Final Report
John D. Waugh and Patricia W. Kilduff Jan. 1984 50 p
(AD-A137315; AD-E500606; HEL-TM-1-84) Avail: NTIS HC A03/MF A01 CSCL 15/2

The US Army Human Engineering Laboratory assessed possible degradation in the performance of missile repair persons while wearing NBC protective clothing. Nine male soldiers, just graduated from the Advanced Individual Training Course in Missile Repair, were required to perform repair tasks in three replications. Two repair tasks were chosen; one considered nondifficult whose activities concentrated on procedural diagnostics and fault isolation; the second considered difficult, required manipulating small machine parts and hand tools requiring fine eye-hand coordination. The experimental results and subsequent comparative statistical analysis showed no degradation in performance of the easier procedures and diagnostic task. The time to complete the more difficult task was degraded (increased) on the average of 45% in MOPP 4 with a definite contribution to degradation attributed to the mask/hood and the protective gloves by themselves. A significant improvement attributed to learning from the first to the second presentation was found, but not from the second to the third presentation. The participants' degree of learning was neither enhanced nor held back while in protective clothing as compared to working in the duty uniform. GRA

N84-20181# Virginia Polytechnic Inst. and State Univ., Blacksburg. Computer Science Industrial Engineering/Operations Research.
GENIE: A COMPUTER-BASED TASK FOR EXPERIMENTS IN HUMAN-COMPUTER INTERACTION
T. E. Lindquist, R. G. Fainter, M. T. Hakkinen, S. R. Guy, and J. F. Maynard Oct. 1983 52 p
(Contract N00014-81-K-0143; RR0-4209)
(AD-A137473; CSIE-83-10) Avail: NTIS HC A04/MF A01 CSCL 05/8

The results of many human-computer interaction studies are often not generalizable because the task environment in which they are run does not posssess characteristics common to other interfaces. In this paper we describe a generalized task environment that is directly applicable to several interesting real-world tasks,

and that contains elements appearing in almost every system having a human-computer interface. The environment is implemented through a software system called GENIE (Generic Environment for Interactive Experiments), and is based on controlling the motion of vehicle through three-dimensional space. Aside from providing a task with common characteristics, GENIE's implementation was designed to allow for adaptation to a variety of studies. The user's interface to the system has been constructed in such a way as to minimize the effort necessary for change. The paper first describes the development of the GENIE software system and then presents its structure. The user's view of the system is discussed followed by a presentation of the facilities available to the experimenter. Software components of the system are described from a functional level, and finally, three example experiments that use the system are described. Author (GRA)

N84-20182# Illinois Univ., Urbana. Lab. for Engineering-Psychology Research.
THE LIMITS OF MULTIPLE RESOURCE THEORY: THE ROLE OF TASK CORRELATION/INTEGRATION IN OPTIMAL DISPLAY FORMATTING
Christopher D. Wickens and David B. Boles Dec. 1983 25 p
(Contract N00014-79-C-0658; NR Proj. 196-158)
(AD-A136692; EPL-83-5/ONR-83-5) Avail: NTIS HC A02/MF A01 CSCL 05/10

This report presents a theory of the optimal display format for tasks that have multiple stimulus elements. Our previous research indicates that these various elements should be presented to display channels that employ separate resources (e.g., be distributed between auditory and visual modalities). In this report we suggest that this distribution should not be done to the extent that (1) the values of the various display elements are correlated (e.g., temperature and pressure of gas in a pipe), (2) the separate elements must be integrated into a single mental model of the environment. Collectively, we define these two conditions as the degree of correlation/integration. As correction/integration increases, the relative advantages of separate resources decreases. The research in our own and other laboratories that supports this concept is reviewed. Author (GRA)

N84-20183# Illinois Univ., Urbana. Lab. for Engineering-Psychology Research.
A COMPARISON OF HOMOGENEOUS AND HETEROGENEOUS DISPLAY FORMATS IN INFORMATION INTEGRATION AND NONINTEGRATION TASKS
David B. Boles and Christopher D. Wickens Dec. 1983 36 p
(Contract N00014-79-C-0658; NR Proj. 196-158)
(AD-A136693; EPL-83-6/ONR-83-6) Avail: NTIS HC A03/MF A01 CSCL 05/8

The multiple resources model states that dual-task performance improves if the component tasks are made minimally similar with respect to the mental resources the demand. The lesser the overlap between stimulus modality, central processing, and response modality resources, the lesser the predicted interference between concurrent tasks. Although the model has generally received support from dual-task experiments, it has not been known whether it generalizes to task environments requiring the combination or integration of information sources prior to response. Here two experiments made use of three tasks varying in terms of integration demands, and presented via four visual display formates for numeric information, presumably varying in the homogeneity of resource demands. These results conceptually replicate previous findings in showing that dual-task environments benefit from the use of nonoverlapping (heterogeneous) resources, presumably because they allow for greater noninterfering parallel processing. Yet when information integration is required, this is no longer true; under certain conditions, benefit is obtained when the information sources to be integrated use overlapping (homogeneous) resources. It appears that the design of optimal displays in applied settings must take into account the degree to which information is to be integrated or responded to separately. GRA

N84-20184# BioTechnology, Inc., Falls Church, Va.
A REVIEW OF MAJOR ISSUES RELATING TO HUMAN-MACHINE INTEGRATION IN THE DEVELOPMENT OF MILITARY SYSTEMS Final Research Note
H. E. Price, C. R. Sawyer, and J. S. Kidd Dec. 1983 46 p
(Contract MDA903-81-C-0541; DA Proj. 2Q1-62722-A-791)
(AD-A136739; ARI-RN-83-51) Avail: NTIS HC A03/MF A01 CSCL 05/8

This paper discusses recurrent problems and deficiencies related to the adequate consideration of human factors, manpower, personnel and training issues in the development of military systems. It provides a brief review and a discussion of these issues from a number of differing perspectives of the varied participants in the development and acquisition community. Author (GRA)

N84-20185# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
APPLIED COGNITIVE SCIENCE
E. E. Smith and A. Collins Dec. 1983 41 p
(Contracts N00014-81-C-0019; N00014-79-C-0338)
(AD-A136780; BBN-5499; TR-2-ONR) Avail: NTIS HC A03/MF A01 CSCL 05/10

One focus of modern cognitive science is the interaction between people and complex systems, such as computer and electronic systems. American society is becoming inundated with more and more complex systems. The skills required to design, operate, and fix these systems have become necessary ones for anyone to function successfully in our society. Teaching people to deal with these systems, and designing the systems so that they are easy for people to use, are important goals for an applied cognitive psychology. In this paper we present a framework for understanding the research in the cognitive sciences on human interaction with systems, and describe some of the best research carried out in this area. Author (GRA)

N84-20186# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
EXPLAINING COMPLEX ENGINEERED DEVICES
D. S. Weld Dec. 1983 50 p
(Contract N00014-79-C-0338)
(AD-A136790; BBN-5489; TR-ONR-7) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper presents the outline of an algorithm which generates summary explanations of and answers questions about complex engineered devices. The algorithm uses two domain models: an expert model of the machine, and a model of the student's device understanding. Also required is an inference engine which can perform qualitative simulations of the device engine from the expert model. Given these prerequisites, the algorithm recursively describes the device in a series of ever more detailed passes. In each pass the device is depicted with a strict sequence of topics: the device's role, function, structure, and then its mechanism. The explanatory algorithm is interesting not only for its potential utility in computer aided instruction but also for the constraints it sets on the contents of an expert tutor's mental model of an engineered device. Author (GRA)

N84-20187# Navy Personnel Research and Development Center, San Diego, Calif.
GUIDE TO THE DEVELOPMENT OF A HUMAN FACTORS ENGINEERING DATA RETRIEVAL SYSTEM Interim Report, 1 Oct. 1981 - 30 Sep. 1982
D. Meister and R. E. Blanchard Nov. 1983 44 p
(F57-526)
(AD-A136918; NPRDC-TR-84-4) Avail: NTIS HC A03/MF A01 CSCL 05/5

This report describes the functional specifications for the development of a human factors engineering (HFE) data retrieval system to be used by system acquisition managers, designers, and HFE specialists. The system is organized around the following requirements: system must be responsive to the needs of a variety of users, include data of the type presently available in MIL STD 1472C plus quantitative estimates of human performance, maintenance and logistics data, specifications and standards, and

analytical and evaluational techniques, include data from operational Navy sources not presently found in any HFE data base, be formatted in three tracks, with Track 1 consisting of abstracts of individual studies, Track 2 containing data from the same sources but in a highly synthesized form, and Track 3 containing all other ancillary information such as HFE specifications and standards.
GRA

N84-20188# Virginia Polytechnic Inst. and State Univ., Blacksburg. Computer Science Industrial Engineering/Operations Research.
ISSUES IN INTERACTION LANGUAGE SPECIFICATION AND REPRESENTATION
D. H. Johnson and H. R. Hartson Nov. 1983 75 p
(Contract N00014-81-K-0143; RR0-4209)
(AD-A136943; AD-E001638; CSIE-83-15) Avail: NTIS HC A04/MF A01 CSCL 05/8

Interaction between a human and a computer necessarily involves the use of a language in which the two can communicate. For application systems which are created under the Dialogue Management System (DMS), this language is usually an interaction language. Issues in the implementation of interaction languages are discussed, including language design, language specification and representation schemes, and language recognition. Components of an interaction language are classified into categories which are analyzed in terms of their specification needs. A model for interaction language specification is presented which depicts several inter-related submodels as a communication path between a dialogue author and an end-user. Because the dialogue author who is creating the user interface for application systems is not expected to be a language specialist, an automated tool to facilitate interaction language design, specification, representation, and parsing is being incorporated into the Author's Interactive Dialogue Environment (AIDE). An interactive example-based interface for syntax specification, Language-By-Example (LBE), guides the dialogue author at design-time in specifying an interaction language for an application system. An example of the use of LBE for defining command strings is presented.
Author (GRA)

N84-20189# Virginia Polytechnic Inst. and State Univ., Blacksburg. Computer Science Industrial Engineering/Operations Research.
THE BEHAVIORAL DEMONSTRATOR: A REQUIREMENTS SPECIFICATION EXECUTOR
J. E. Callan, III May 1983 62 p
(Contract N00014-81-K-0143; RR04209)
(AD-A136944; AD-E001638; CSIE-83-14) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report presents a design for tools which aid in the requirements verification of computer systems. These tools use a very high level graphical requirements specification language and a system development methodology for human-computer systems. The report moves from an abstract design to actual implementation and uses a sample application system throughout the illustration.
Author (GRA)

N84-20190# Virginia Polytechnic Inst. and State Univ., Blacksburg. Computer Science Industrial Engineering/Operations Research.
DIALOGUE MANAGEMENT: NEW CONCEPTS IN HUMAN-COMPUTER INTERFACE DEVELOPMENT
H. R. Hartson and D. H. Johnson Nov. 1983 56 p
(Contract N00014-81-K-0143; RR04209)
(AD-A136945; AD-E001638; CSIE-83-13) Avail: NTIS HC A04/MF A01 CSCL 05/8

Dialogue Management is an emerging field which emphasizes a specialization in the development of quality human-computer interfaces. It encompasses the design, implementation, simulation, execution, maintenance, and metering of dialogues in an integrated environment. Several key concepts in dialogue management have been identified in response to the need for improved human-computer interfaces. These concepts are surveyed here, and their importance to dialogue design and management is discussed. Dialogue independence and internal and external dialogue are manifest in the separation of the dialogue components of a software system from the computational components. In a new system design role, a dialogue author is responsible for creating the dialogue which constitutes the human-computer interface of an application system. A holistic methodological approach to system development places emphasis on the development of both dialogue and computational components of an application system. Systems are now being built which incorporate many of these important concepts in the management of dialogues for human-computer systems. Several of these systems are mentioned as examples of concepts application, and one such system is described in some detail.
Author (GRA)

N84-20191# Michigan Univ., Ann Arbor. Robot Systems Div.
COORDINATED RESEARCH IN ROBOTICS AND INTEGRATED MANUFACTURING Annual Report, 1 Aug. 1982 - 31 Jul. 1983
D. E. Atkins and R. A. Volz 31 Jul. 1983 135 p
(Contract F49620-82-C-0089; AF Proj. 2306)
(AD-A137042; RSD-TR-17-83; AFOSR-83-1340TR; AR-1) Avail: NTIS HC A07/MF A01 CSCL 13/8

The research procured under this contract is oriented toward the understanding and development of the flexible robot based manufacturing cells or islands which will increasingly become a basic blocks for the building of modern parts production and assembly facilities. Present work spans a hierarchy of sub-systems oriented toward the development and integration of high performance manipulators into flexible manufacturing cells. These subsystems may be divided into several levels of abstraction: Level 1: The mechanical structure and low-level (small time-constant) control of high-performance manipulators; The sensor sub-systems (force, tactile, thermal, and vision); Computer architecture and languages which form the basis of robot systems and manufacturing cells; Level 2: Integration of mechanical structure, computer system and sensor to form flexible robot systems; Level 3: The integration of systems with production and assembly machines and information contained in the manufacturer's computer-aided design database; and Level 4: Integration of the factory-wide distributed database which is central to the design, production and business functions of manufacturing.
GRA

N84-20192# Air Force Human Resources Lab., Brooks AFB, Tex.
NONLINEAR PREDICTION OF HEAD MOVEMENTS FOR HELMET-MOUNTED DISPLAYS Final Technical Paper
U. H. List Dec. 1983 25 p
(AF Proj. 2743)
(AD-A136590; AFHRL-TP-83-45) Avail: NTIS HC A02/MF A01 CSCL 05/9

In head-and eye-slaved visual systems, lag times in the visual feedback loop are more apparent than they are in conventional fixed display systems. The available technology of digital image generators does not permit lag times to be reduced to the required amount. Therefore, appropriate prediction algorithms have to be developed. Accelerometers were used to measure the step response of the head in three axes of rotation. It could be shown that linear prediction does not provide the necessary accuracy in the simulated position. A further analysis of the recorded data revealed that it is possible to take advantage of the head's latency to improve the prediction. A simple nonlinear prediction algorithm based on acceleration data was successfully implemented in the fiber optic helmet-mounted display.
Author (GRA)

N84-20193# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
REPORT ON STUDY TRIP TO FRANCE, 28 JUNE-9 JULY 1983
B. Ch. R. Stroemblad and L. E. Larsson Nov. 1983 38 p Partly in ENGLISH, SWEDISH and FRENCH
(FOA-C-59007-H1; ISSN-0347-7665) Avail: NTIS HC A03/MF A01

High altitude clothing, acceleration protection, chemical warfare protection, anti-wind blast suits, oxygen masks and oxygen regulators are discussed. A lightweight pressure controlled oronasal mask-helmet system with an automatically operating device for keeping the mask against the face is described.
Author (ESA)

N84-20194 California Univ., Berkeley.
MODEL REFERENCE ADAPTIVE CONTROL OF MECHANICAL MANIPULATORS Ph.D. Thesis
Roberto Horowitz 1983 259 p
Avail: Univ. Microfilms Order No. DA8328915

The use of techniques to the dynamic control of mechanical manipulators is demonstrated and evaluated. The mathematical modeling of mechanical manipulators is discussed and the dynamic equations of mechanical manipulators are derived. Making use of the fundamental properties of the manipulator equations, a simple continuous time adaptive algorithm is developed for compensating nonlinear terms in the dynamic equations and for decoupling the dynamic interactions. In addition, an alternate discrete time model reference adaptive control algorithm, based on the independent tracking and regulation design, is presented. A computer simulation study, using a three degree of freedom manipulator model, is conducted to evaluate the performance of both the continuous and discrete time manipulator control systems. Simulation results show that both adaptive control schemes are effective in reducing the sensitivity of the manipulator performance to configuration and payload variations. Dissert. Abstr.

N84-19428# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
SPACELAB/ORBITER ATMOSPHERE REVITALIZATION SUBSYSTEM COMMONALITY AND FLIGHT EXPERIENCE
P. Lautenbach, R. Vaeth, and J. E. Swider (Hamilton Standard, Windsor Locks, Conn.) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 271-279 (For primary document see N84-19396 10-18)
(Contract ERNO-CC-DS-000-100)
Avail: NTIS HC A25/MF A01

N84-19429# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
THE COMPLEMENTARY ROLES OF EXISTING AND ADVANCED ENVIRONMENTAL, THERMAL CONTROL AND LIFE SUPPORT TECHNOLOGY FOR SPACE STATIONS
A. I. Skoog and H. F. Brose (Hamilton Standard, Windsor Locks, Conn.) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 281-288 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19634*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OPERATOR WORKLOAD MEASUREMENT VALIDATION FOR THE MARK IV DSCC MONITOR AND CONTROL SUBSYSTEM
M. LeMay (Montclair State Coll.), E. E. Hird, and B. Y. Rodriquez *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 132-140 refs (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 05H

N84-19894# Patras Univ. (Greece). Dept. of Mechanical and Electrical Engineering.
RESEARCHING THE MAN-MACHINE SYSTEM AS A FUNCTION OF SOIL-ENVIRONMENT SYSTEM
A. Massinas and P. Drakatos (MIT) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 1-8 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 05/8

N84-19895# Patras Univ. (Greece). Dept. of Mechanical and Electrical Engineering.
A STOCHASTIC MODEL FOR THE MAN-MACHINE-SOIL-ENVIRONMENT SYSTEM (MMSES) AND THE INFLUENCE OF VIBRATIONS
A. Massinas and P. Drakatos (MIT) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 9-18 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 05/8

N84-19896# Concordia Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
AN OPTIMUM SEAT-SUSPENSION FOR OFF-ROAD VEHICLES
S. Rakheja and S. Sankar *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 19-34 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 05/8

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

N84-19639*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SETI INVESTIGATIONS AT JODRELL BANK, ENGLAND: SEPTEMBER THROUGH NOVEMBER 1983
G. S. Downs and S. Gulkis *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 196-205 ref (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 22A

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N84-20195*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
[INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND ENGINEERING (ICASE)] Final Semiannual Report, 1 Apr. - 30 Sep. 1983
Feb. 1984 52 p
(Contracts NAS1-17070; NAS1-17130)
(NASA-CR-172304; NAS 1.26:172304) Avail: NTIS HC A04/MF A01 CSCL 12A

Research conducted at the Institute for Computer Applications in Science and Engineering in applied mathematics, numerical analysis and computer science during the period April 1, 1983 through September 30, 1983 is summarized. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N84-20196*# National Aeronautics and Space Administration, Washington, D. C.
THE DFVLR MAIN DEPARTMENT FOR CENTRAL DATA PROCESSING, 1976 - 1983
Dec. 1983 131 p Transl. into ENGLISH of "Hauptabteilung Zentrale Datenverarbeitung, 1976-1983" Oberpfaffenhofen, West Germany, 22 Sep. 1983 170 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by DFVLR, Oberpfaffenhofen, West Germany
(Contract NASw-3541)
(NASA-TM-77314; NAS 1.15:77314) Avail: NTIS HC A07/MF A01 CSCL 09B

Data processing, equipment and systems operation, operative and user systems, user services, computer networks and communications, text processing, computer graphics, and high power computers are discussed. N.W.

N84-20197*# Arizona Univ., Tucson. Dept. of Planetary Sciences.

DEVELOPMENT INTERDATA 8/32 COMPUTER SYSTEM
C. P. Sonett Mar. 1983 16 p
(Grant NsG-7024)
(NASA-CR-175425; NAS 1.26:175425) Avail: NTIS HC A02/MF A01 CSCL 09B

The capabilities of the Interdata 8/32 minicomputer were examined regarding data and word processing, editing, retrieval, and budgeting as well as data management demands of the user groups in the network. Based on four projected needs: (1) a hands on (open shop) computer for data analysis with large core and disc capability; (2) the expected requirements of the NASA data networks; (3) the need for intermittent large core capacity for theoretical modeling; (4) the ability to access data rapidly either directly from tape or from core onto hard copy, the system proved useful and adequate for the planned requirements. M.A.C.

N84-20198# Naval Postgraduate School, Monterey, Calif.
A MICROCOMPUTER BASED GENERAL LINEAR PROGRAMMING OPTIMIZATION PACKAGE M.S. Thesis
D. W. Theune Sep. 1983 74 p
(AD-A137506) Avail: NTIS HC A04/MF A01 CSCL 09/2

The importance of mathematical models as tools in decision making has motivated increased interest in that theory and its implementation. This paper describes fundamental techniques of linear programming which have been combined to offer a microcomputer based optimization package. The package is machine portable and will accept input from files created by other programs. Thus the package affords the opportunity to build a mathematical programming system based on its ability to solve bounded variable linear sub-programs. Written in JRT PASCAL 3.0 and implemented on a portable, 8-bit microcomputer (KAYPRO-II), this package places the fundamental tool of optimization in the office, classroom and home. Author (GRA)

N84-20199# Softech, Inc., Waltham, Mass.
ADA COMPILER VALIDATION SUMMARY REPORT: ROLM ADA COMPILER, VERSION 4.42 V-002 Progress Report, 9-12 May 1983
John B. Goodenough 12 May 1983 80 p
(Contract MDA903-79-C-0687)
(AD-A136732) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report describes the results of the validation effort for the following Ada translator: Host Machine: ROLM MSE/800, Data General MV/4000, MV/6000, MV/8000, and MV/10000; Operating System: AOS/VS-Ada 2.03; Host Disk System: 2.96 megabyte drives; Target Machine: ROLM MSE/800, Data General MV/4000, MV/6000, MV/8000, and MV/10000; Operating System: AOS/VS-Ada 2.03; Language Version; ANSI/MIL-STD-1815A Ada; Translator Version: 4.42; and Validator Version: 1.1 (March 4, 1983). Testing of this translator was conducted by SofTech, Inc. The purpose of this report is to document the results of the testing performed on the translator, and in particular, to: identify any language constructs, supported by the translator that do not conform to the Ada standard; identify any unsupported language constructs required by the Ada standard; and describe implementation-dependent behavior allowed by the standard. GRA

N84-20200# Softech, Inc., Waltham, Mass.
ADA COMPILER VALIDATION REPORT: WESTERN DIGITAL STC-ADA COMPILER, VERSION C1.OM V-004 Summary Report, 26 - 28 Jul. 1983
28 Jul. 1983 53 p
(Contract MDA903-79-C-0687)
(AD-A136738) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes the results of the validation effort for the following Ada translator: Host Machine: Western Digital WD1600 Series MicroEngine; Operating System: STC Ada Operating System 2.9; Host Disk System: 10 megabyte Winchester; Target Machine: Western Digital WD1600 Series MicroEngine; Operating System: STC Ada Operating System 2.9; Language Version: ANSI/MIL-STD-1815A Ada; Translator Name: STC-Ada; Translator Version: C1.0m; and Validator Version: 1.1 (March 4, 1983). Testing of this translator was conducted by SofTech, Inc. The purpose of this report is to document the results of the testing performed on the translator, and in particular, to: identify any language constructs supported by the translator that do not conform to the Ada standard; identify any unsupported language constructs required by the Ada standard; and describe implementation-dependent behavior allowed by the standard. GRA

N84-20201# Softech, Inc., Waltham, Mass.
ADA COMPILER VALIDATION SUMMARY REPORT: NYU ADA/ED, VERSION 19.7 V-001
11 Apr. 1983 54 p
(Contract MDA903-79-C-0687)
(AD-A136759) Avail: NTIS HC A04/MF A01 CSCL 09/2

The New York University Ada translator (NYU Ada/Ed), version 19.7 (March 21, 1983), was tested with version 1.1 (March 4, 1983) of the ACVC validation tests. Version 1.1 of the test suite contained 1,633 tests, of which 1,325 were applicable to NYU Ada/Ed. Of the applicable tests, 14 were withdrawn, due to errors in the tests. NYU Ada/Ed passed all of the remaining 1,311 applicable correct tests. GRA

N84-20202# Softech, Inc., Waltham, Mass.
ADA COMPILER VALIDATION SUMMARY REPORT: ROLM ADA COMPILER, VERSION 4.52 V-003
3 Jun. 1983 141 p
(Contract MDA903-79-C-0687)
(AD-A136760) Avail: NTIS HC A07/MF A01 CSCL 09/2

The ROLM Ada compiler, version 4.52, was tested in June 1983 with version 1.1 (March 4, 1983) of the ACVC validation tests. Version 1.1 of the test suite contained 1,595 tests, of which 1,292 were applicable to this compiler. Of the applicable tests, 56 were withdrawn due to errors in the tests. All of the remaining 1,235 applicable correct tests were passed. GRA

N84-20203# Naval Postgraduate School, Monterey, Calif.
IMPLEMENTATION OF A RELIABILITY SHORTHAND ON THE APPLE 2(+) MICROCOMPUTER M.S. Thesis
E. Bartens Sep. 1983 56 p
(AD-A136778) Avail: NTIS HC A04/MF A01 CSCL 09/2

It is shown how to use a reliability shorthand to get analytical results for small systems. The underlying probability distribution is the exponential function. An algorithm is described to convolve exponentially distributed random variables, and two computer programs are given to obtain numerical results for convolutions and mixed convolutions. After describing systems in shorthand notation, the programs can be used to compute reliabilities for those systems. The programs are coded in UCSD-Pascal for use with an Apple II+ and an Apple III. Author (GRA)

N84-20204# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HONEYWELL INFORMATION SYSTEMS, DPS 8/49C, COBOL CB4.3U1 B06 Validation Summary Report
3 Nov. 1983 74 p refs
(PB84-134758; OSD/FSTC-83/270) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems, COBOL CB4.3U1 Version B06 running under the CP-6 Version B03 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High Level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N84-20205# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HONEYWELL INTERNATIONAL SYSTEMS DPS 8/70 FORTRAN-

77 REL COO Validation Summary Report
3 Nov. 1983 13 p refs
(PB84-136191; OSD/FSTC-83/271) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems, FORTRAN-77 Release BO3 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N84-20206# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
TANDEM COMPUTERS, INCORPORATED, TANDEM NONSTOP 2 COBOL T9201E01 Validation Summary Report
31 Oct. 1983 52 p refs
(PB84-137199; OSD/FSTC-82/335) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Tandem Computers, Inc., COBOL T9201E01 running under the Guardian T9050A05 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N84-19628*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TRANSFER FUNCTION BOUNDS FOR PARTIAL-UNIT-MEMORY CONVOLUTIONAL CODES BASED ON REDUCED STATE DIAGRAM
P. J. Lee *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 70-76 refs (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 09B

N84-19631*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SYSTOLIC VLSI DESIGN OF A PIPELINE REED-SOLOMON DECODER
H. M. Shao, T. K. Truong, L. J. Deutsch, J. H. Yuen, and I. S. Reed (Univ. of Southern California) *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 99-113 refs (For primary document see N84-19621 10-32)
Avail: NTIS HC A10/MF A01 CSCL 09B

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-20207*# Georgia Univ., Athens.
OPERATION OF THE COMPUTER SOFTWARE MANAGEMENT AND INFORMATION CENTER (COSMIC) Annual Report, 1 Jan. - 31 Dec. 1983
1983 63 p
(Contract NASw-3247)
(NASA-CR-173353; NAS 1.26:173353) Avail: NTIS HC A04/MF A01 CSCL 09B

The major operational areas of the COSMIC center are described. Quantitative data on the software submittals, program verification, and evaluation are presented. The dissemination activities are summarized. Customer services and marketing activities of the center for the calendar year are described. Those activities devoted to the maintenance and support of selected programs are described. A Customer Information system, the COSMIC Abstract Recording System Project, and the COSMIC Microfiche Project are summarized. Operational cost data are summarized. N.W.

N84-20208*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CYBER 200 APPLICATIONS SEMINAR
J. Patrick Gary, comp. Mar. 1984 342 p refs Seminar held in Lanham, Md., 10-12 Oct. 1983; sponsored in cooperation with Control Data Corp.
(NASA-CP-2295; NAS 1.55:2295; Rept-84F5215) Avail: NTIS HC A15/MF A01 CSCL 09B

Applications suited for the CYBER 200 digital computer are discussed. Various areas of application including meteorology, algorithms, fluid dynamics, monte carlo methods, petroleum, electronic circuit simulation, biochemistry, lattice gauge theory, economics and ray tracing are discussed. For individual titles, see N84-20209 through N84-20233.

N84-20209*# Meteorological Office, Bracknell (England).
MATHEMATICAL ALGORITHMS TO MAXIMIZE PERFORMANCE IN NUMERICAL WEATHER PREDICTION
Aileen Foreman *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 1-13 (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Numerical weather prediction models, which involve the solution of non-linear partial differential equations at points on an extensive three dimensional grid, are ideally suited for processing on vector machines. It was logical therefore that the new global forecast model to be implemented at the Meteorological Office should be written in vector code for the CYBER 205. In order to achieve full efficiency and to reduce storage requirements the model used 32-bit arithmetic which was found to provide high enough precision. Unfortunately, however, the trigonometrical and logarithmic functions provided by CDC could only handle 64-bit vectors and, although written in efficient scalar code, did not take advantage of the special facilities of a vector processor. It was therefore necessary to rewrite the functions in vector code to handle both 32 and 64-bit vectors. There was also no half-precision compiler available for the Cyber 205 at that time and so the functions, like the model, had to make extensive use of the special call syntax. This made the code more difficult to write but it allowed much greater flexibility in that it became possible to access the exponent of a floating-point number independently of its coefficient. A description is given of the technique and the results which were achieved are summarized. R.J.F.

N84-20210*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPUTER SIMULATIONS OF SPACE-BORNE METEOROLOGICAL SYSTEMS ON THE CYBER 205
Milton Halem *In its* CYBER 200 Appl. Seminar Mar. 1984 p 15-17 (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Because of the extreme expense involved in developing and flight testing meteorological instruments, an extensive series of numerical modeling experiments to simulate the performance of meteorological observing systems were performed on CYBER 205. The studies compare the relative importance of different global measurements of individual and composite systems of the meteorological variables needed to determine the state of the atmosphere. The assessments are made in terms of the systems ability to improve 12 hour global forecasts. Each experiment involves the daily assimilation of simulated data that is obtained from a data set called nature. This data is obtained from two sources: first, a long two-month general circulation integration with the GLAS 4th Order Forecast Model and second, global analysis

prepared by the National Meteorological Center, NOAA, from the current observing systems twice daily. R.J.F.

N84-20211*# National Weather Service, Washington, D.C.
OPERATIONAL NUMERICAL WEATHER PREDICTION ON THE CYBER 205 AT THE NATIONAL METEOROLOGICAL CENTER
Dennis Deaven *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 19-24 (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

The Development Division of the National Meteorological Center (NMC), having the responsibility of maintaining and developing the numerical weather forecasting systems of the center, is discussed. Because of the mission of NMC data products must be produced reliably and on time twice daily free of surprises for forecasters. Personnel of Development Division are in a rather unique situation. They must develop new advanced techniques for numerical analysis and prediction utilizing current state-of-the-art techniques, and implement them in an operational fashion without damaging the operations of the center. With the computational speeds and resources now available from the CYBER 205, Development Division Personnel will be able to introduce advanced analysis and prediction techniques into the operational job suite without disrupting the daily schedule. The capabilities of the CYBER 205 are discussed. R.J.F.

N84-20212*# National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
OCEAN MODELLING ON THE CYBER 205 AT GFDL
Michael Cox *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 25-32 ref (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

At the Geophysical Fluid Dynamics Laboratory, research is carried out for the purpose of understanding various aspects of climate, such as its variability, predictability, stability and sensitivity. The atmosphere and oceans are modelled mathematically and their phenomenology studied by computer simulation methods. The present state-of-the-art in the computer simulation of large scale oceans on the CYBER 205 is discussed. While atmospheric modelling differs in some aspects, the basic approach used is similar. The equations of the ocean model are presented along with a short description of the numerical techniques used to find their solution. Computational considerations and a typical solution are presented in section 4. R.J.F.

N84-20213*# Systems and Applied Sciences Corp., Hyattsville, Md.
MEMORY EFFICIENT SOLUTION OF THE PRIMITIVE EQUATIONS FOR NUMERICAL WEATHER PREDICTION ON THE CYBER 205
James J. Tuccillo *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 33-60 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Numerical Weather Prediction (NWP), for both operational and research purposes, requires only fast computational speed but also large memory. A technique for solving the Primitive Equations for atmospheric motion on the CYBER 205, as implemented in the Mesoscale Atmospheric Simulation System, which is fully vectorized and requires substantially less memory than other techniques such as the Leapfrog or Adams-Bashforth Schemes is discussed. The technique presented uses the Euler-Backard time marching scheme. Also discussed are several techniques for reducing computational time of the model by replacing slow intrinsic routines by faster algorithms which use only hardware vector instructions. R.J.F.

N84-20214*# Agouron Inst., La Jolla, Calif.
COMPUTER SIMULATION OF PROTEIN SYSTEMS
D. J. Osguthorpe, P. Dauber-Osguthorpe, J. Wolff, D. H. Kitson, and A. T. Hagler *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 61-67 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Ligand binding to dihydrofolate reductase (DHFR) is discussed. This is an extremely important enzyme, as it is the target of several drugs (inhibitors) which are used clinically as antibacterials, antiprotozoals and in cancer chemotherapy. DHFR catalyzes the NADPH (reduced nicotinamide adenine dinucleotide phosphate) dependent reduction of dihydrofolate to tetrahydrofolate, which is used in several pathways of purine and pyrimidine iosynthesis, including that of thymidylate. Since DNA synthesis is dependent on a continuing supply of thymidylate, a blockade of DHFR resulting in a depletion of thymidylate can lead to the cessation of growth of a rapidly proliferating cell line. DHFR exhibits a significant species to species variability in its sensitivity to various inhibitors. For example, trimethoprim, an inhibitor of DHFR, binds to bacterial DHFR's 5 orders of magnitude greater than to vertebrate DHFR's. The structural mechanics, dynamics and energetics of a family of dihydrofolate reductases are studied to rationalize the basis for the inhibitor of these enyzmes and to understand the molecular basis of the difference in the binding constants between the species. This involves investigating the conformational changes induced in the protein on binding the ligand, the internal strain imposed by the enzyme on the ligand, the restriction of fluctuations in atom positions due to binding and the consequent change in entropy. R.J.F.

N84-20215*# Control Data Corp., Oakland, Calif.
VLSI CIRCUIT SIMULATION USING A VECTOR COMPUTER
Stephen K. McGrogan *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 69-76 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Simulation of circuits having more than 2000 active devices requires the largest, fastest computers available. A vector computer, such as the CYBER 205, can yield great speed and cost advantages if efforts are made to adapt the simulation program to the strengths of the computer. ASPEC and SPICE (1), two widely used circuit simulation programs, are discussed. ASPECV and VAMOS (5) are respectively vector adaptations of these two simulators. They demonstrate the substantial performance enhancements possible for this class of algorithm on the CYBER 205. R.J.F.

N84-20216*# Knolls Atomic Power Lab., Schenectady, N. Y.
VECTORIZED MONTE CARLO METHODS FOR REACTOR LATTICE ANALYSIS
Forrest B. Brown *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 77-81 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Some of the new computational methods and equivalent mathematical representations of physics models used in the MCV code, a vectorized continuous-enery Monte Carlo code for use on the CYBER-205 computer are discussed. While the principal application of MCV is the neutronics analysis of repeating reactor lattices, the new methods used in MCV should be generally useful for vectorizing Monte Carlo for other applications. For background, a brief overview of the vector processing features of the CYBER-205 is included, followed by a discussion of the fundamentals of Monte Carlo vectorization. The physics models used in the MCV vectorized Monte Carlo code are then summarized. The new methods used in scattering analysis are presented along with details of several key, highly specialized computational routines. Finally, speedups relative to CDC-7600 scalar Monte Carlo are discussed. R.J.F.

N84-20217*# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
VIBRATIONAL RELAXATION OF DIATOMIC MOLECULES IN SOLIDS AT LOW TEMPERATURES
Lawrence L. Halcomb and Dennis J. Diestler *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 83-99 (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

The application of a hemiquantal method to the specific problem of the vibrational relaxation of a diatomic molecule embedded in a one dimensional lattice is presented. The vectorization of a CYBER 205 algorithm which integrates the 1,000 to 10, 000 simultaneous hemiquantal differential equations is examined with comments on optimization. Results of the simulations are briefly discussed. R.J.F.

N84-20218*# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

CHEMICAL APPLICATION OF DIFFUSION QUANTUM MONTE CARLO

Peter J. Reynolds and William A. Lester, Jr. *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 101-116 refs (For primary document see N84-20208 10-61)
(Contract DE-AC03-76SF-00098)
Avail: NTIS HC A15/MF A01 CSCL 09B

The diffusion quantum Monte Carlo (QMC) method gives a stochastic solution to the Schroedinger equation. This approach is receiving increasing attention in chemical applications as a result of its high accuracy. However, reducing statistical uncertainty remains a priority because chemical effects are often obtained as small differences of large numbers. As an example, the single-triplet splitting of the energy of the methylene molecule CH sub 2 is given. The QMC algorithm was implemented on the CYBER 205, first as a direct transcription of the algorithm running on the VAX 11/780, and second by explicitly writing vector code for all loops longer than a crossover length C. The speed of the codes relative to one another as a function of C, and relative to the VAX, are discussed. The computational time dependence obtained versus the number of basis functions is discussed and this is compared with that obtained from traditional quantum chemistry codes and that obtained from traditional computer architectures. R.J.F.

N84-20219*# Control Data Corp., Fort Collins, Colo.

A HIGHLY OPTIMIZED VECTORIZED CODE FOR MONTE CARLO SIMULATIONS OF SU(3) LATTICE GAUGE THEORIES

D. Barkai, K. J. M. Moriarty (Dalhousie Univ.), and C. Rebbi (Brookhaven National Lab.) *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 117-144 refs Presented at the Intern. Conf. Parallel Computing '83, Berlin, 26-28 Sep. 1983 (For primary document see N84-20208 10-61)
(Contract DE-AC02-76CH-00016)
Avail: NTIS HC A15/MF A01 CSCL 09B

New methods are introduced for improving the performance of the vectorized Monte Carlo SU(3) lattice gauge theory algorithm using the CDC CYBER 205. Structure, algorithm and programming considerations are discussed. The performance achieved for a 16(4) lattice on a 2-pipe system may be phrased in terms of the link update time or overall MFLOPS rates. For 32-bit arithmetic, it is 36.3 microsecond/link for 8 hits per iteration (40.9 microsecond for 10 hits) or 101.5 MFLOPS. R.J.F.

N84-20220*# Texas Univ., Austin. Center for Numerical Analysis.

ADAPTING ITERATIVE ALGORITHMS FOR SOLVING LARGE SPARSE LINEAR SYSTEMS FOR EFFICIENT USE ON THE CDC CYBER 205

David R. Kincaid and David M. Young *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 145-160 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Adapting and designing mathematical software to achieve optimum performance on the CYBER 205 is discussed. Comments and observations are made in light of recent work done on modifying the ITPACK software package and on writing new software for vector supercomputers. The goal was to develop very efficient vector algorithms and software for solving large sparse linear systems using iterative methods. R.J.F.

N84-20221*# Colorado State Univ., Fort Collins.

FUNDAMENTAL ORGANOMETALLIC REACTIONS: APPLICATIONS ON THE CYBER 205

Anthony K. Rappe *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 161-184 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Two of the most challenging problems of Organometallic chemistry (loosely defined) are pollution control with the large space velocities needed and nitrogen fixation, a process so capably done by nature and so relatively poorly done by man (industry). For a computational chemist these problems are on the fringe of what is possible with conventional computers (large models needed and accurate energetics required). A summary of the algorithmic modification needed to address these problems on a vector processor such as the CYBER 205 and a sketch of findings to date on deNOx catalysis and nitrogen fixation are presented. Author

N84-20222*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THREE-DIMENSIONAL FLOW OVER A CONICAL AFTERBODY CONTAINING A CENTERED PROPULSIVE JET: A NUMERICAL SIMULATION

G. S. Deiwert and Herbert Rothmund (Control Data Corp., Sunnyvale, Calif.) *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 185-197 refs Previously announced in IAA as A83-45518 (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01

The supersonic flow field over a body of revolution incident to the free stream is simulated numerically on a large, array processor (the CDC CYBER 205). The configuration is composed of a cone-cylinder forebody followed by a conical afterbody from which emanates a centered, supersonic propulsive jet. The free-stream Mach number is 2, the jet-exist Mach number is 2.5, and the jet-to-free-stream static pressure ratio is 3. Both the external flow and the exhaust are ideal air at a common total temperature. Author

N84-20223*# California Inst. of Tech., Pasadena. Dept. of Applied Mathematics.

STEADY VISCOUS FLOW PAST A CIRCULAR CYLINDER

Bengt Fornberg *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 199-224 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Viscous flow past a circular cylinder becomes unstable around Reynolds number Re = 40. With a numerical technique based on Newton's method and made possible by the use of a supercomputer, steady (but unstable) solutions have been calculated up to Re = 400. It is found that the wake continues to grow in length approximately linearly with Re. However, in conflict with available asymptotic predictions, the width starts to increase very rapidly around Re = 300. All numerical calculations have been performed on the CDC CYBER 205 at the CDC Service Center in Arden Hills, Minnesota. Author

N84-20224*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

NAVIER-STOKES SIMULATION OF HOMOGENEOUS TURBULENCE ON THE CYBER 205

C. T. Wu, J. H. Ferziger, D. R. Chapman, and R. S. Rogallo *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 225-239 refs Prepared in cooperation with Stanford Univ., Calif. (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

A computer code which solves the Navier-Stokes equations for three dimensional, time-dependent, homogenous turbulence has been written for the CYBER 205. The code has options for both 64-bit and 32-bit arithmetic. With 32-bit computation, mesh sizes up to 64 (3) are contained within core of a 2 million 64-bit word memory. Computer speed timing runs were made for various vector lengths up to 6144. With this code, speeds a little over 100 Mflops have been achieved on a 2-pipe CYBER 205. Several problems encountered in the coding are discussed. Author

N84-20225*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFICIENT SPARES MATRIX MULTIPLICATION SCHEME FOR THE CYBER 203
Jules J. Lambiotte, Jr. *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 241-256 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

This work has been directed toward the development of an efficient algorithm for performing this computation on the CYBER-203. The desire to provide software which gives the user the choice between the often conflicting goals of minimizing central processing (CPU) time or storage requirements has led to a diagonal-based algorithm in which one of three types of storage is selected for each diagonal. For each storage type, an initialization sub-routine estimates the CPU and storage requirements based upon results from previously performed numerical experimentation. These requirements are adjusted by weights provided by the user which reflect the relative importance the user places on the resources. The three storage types employed were chosen to be efficient on the CYBER-203 for diagonals which are sparse, moderately sparse, or dense; however, for many densities, no diagonal type is most efficient with respect to both resource requirements. The user-supplied weights dictate the choice. B.W.

N84-20226*# Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
MODELING MATERIAL FAILURE WITH A VECTORIZED ROUTINE
S. M. Cramer and J. R. Goodman *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 257-271 refs (For primary document see N84-20208 10-61)
(Grant NSF CME-79-18170)
Avail: NTIS HC A15/MF A01 CSCL 09B

The computational aspects of modelling material failure in structural wood members are presented with particular reference to vector processing aspects. Wood members are considered to be highly orthotropic, inhomogeneous, and discontinuous due to the complex microstructure of wood material and the presence of natural growth characteristics such as knots, cracks and cross grain in wood members. The simulation of strength behavior of wood members is accomplished through the use of a special purpose finite element/fracture mechanics routine, program STARW (Strength Analysis Routine for Wood). Program STARW employs quadratic finite elements combined with singular crack tip elements in a finite element mesh. Vector processing techniques are employed in mesh generation, stiffness matrix formation, simultaneous equation solution, and material failure calculations. The paper addresses these techniques along with the time and effort requirements needed to convert existing finite element code to a vectorized version. Comparisons in execution time between vectorized and nonvectorized routines are provided. B.W.

N84-20227*# Control Data Corp., Sunnyvale, Calif.
ALGORITHMS FOR SOLVING LARGE SPARSE SYSTEMS OF SIMULTANEOUS LINEAR EQUATIONS ON VECTOR PROCESSORS
Ronald E. David *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 273-287 (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Very efficient algorithms for solving large sparse systems of simultaneous linear equations have been developed for serial processing computers. These involve a reordering of matrix rows and columns in order to obtain a near triangular pattern of nonzero elements. Then an LU factorization is developed to represent the matrix inverse in terms of a sequence of elementary Gaussian eliminations, or pivots. In this paper it is shown how these algorithms are adapted for efficient implementation on vector processors. Results obtained on the CYBER 200 Model 205 are presented for a series of large test problems which show the comparative advantages of the triangularization and vector processing algorithms. B.W.

N84-20228*# New York Univ., New York. Inst. for Economic Analysis.
PRELIMINARY RESULTS IN IMPLEMENTING A MODEL OF THE WORLD ECONOMY ON THE CYBER 205: A CASE OF LARGE SPARSE NONSYMMETRIC LINEAR EQUATIONS
Daniel B. Szyld *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 277-287 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

A brief description of the Model of the World Economy implemented at the Institute for Economic Analysis is presented, together with our experience in converting the software to vector code. For each time period, the model is reduced to a linear system of over 2000 variables. The matrix of coefficients has a bordered block diagonal structure, and we show how some of the matrix operations can be carried out on all diagonal blocks at once. B.W.

N84-20229*# Brown Univ., Providence, R. I.
MONTE CARLO CALCULATIONS OF ELEMENTARY PARTICLE PROPERTIES
G. S. Guralnik, Tony Warnock (Cray Research, Minneapolis), and Charles Zemach (LASL) *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 289-296 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

The object of this project is to calculate the masses of the elementary particles. This ambitious goal apparently is not possible using analytic methods or known approximation methods. However, it is probable that the power of a modern super computer will make at least part of the low lying mass spectrum accessible through direct numerical computation. Initial attempts by several groups at calculating this spectrum on small lattices of space time points have been very promising. Using new methods and super computers considerable progress has been made towards evaluating the mass spectrum on comparatively large lattices. Only more time and faster machines with increased storage will allow calculations of systems with guaranteed minimal boundary effects. The ideas that currently go into this calculation are outlined. B.W.

N84-20230*# Control Data Corp., Fort Collins, Colo.
VECTORIZED MULTIGRID POISSON SOLVER FOR THE CDC CYBER 205
David Barkai and Maynard A. Brandt (Weizmann Inst. of Science) *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 297-311 refs Presented at the Intern. Multigrid Conf., Copper Mountain, Colo., 6-8 Apr. 1983 (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

The full multigrid (FMG) method is applied to the two dimensional Poisson equation with Dirichlet boundary conditions. This has been chosen as a relatively simple test case for examining the efficiency of fully vectorizing of the multigrid method. Data structure and programming considerations and techniques are discussed, accompanied by performance details. Author

N84-20231*# Purdue Univ., Lafayette, Ind.
THE VECTORIZATION OF A RAY TRACING PROGRAM FOR IMAGE GENERATION
David J. Plunkett, Joseph M. Cychosz, and Michael J. Bailey *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 313-323 ref (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Ray tracing is a widely used method for producing realistic computer generated images. Ray tracing involves firing an imaginary ray from a view point, through a point on an image plane, into a three dimensional scene. The intersections of the ray with the objects in the scene determines what is visible at the point on the image plane. This process must be repeated many times, once for each point (commonly called a pixel) in the image plane. A typical image contains more than a million pixels making this process computationally expensive. A traditional ray tracing

program processes one ray at a time. In such a serial approach, as much as ninety percent of the execution time is spent computing the intersection of a ray with the surface in the scene. With the CYBER 205, many rays can be intersected with all the bodies im the scene with a single series of vector operations. Vectorization of this intersection process results in large decreases in computation time. The CADLAB's interest in ray tracing stems from the need to produce realistic images of mechanical parts. A high quality image of a part during the design process can increase the productivity of the designer by helping him visualize the results of his work. To be useful in the design process, these images must be produced in a reasonable amount of time. This discussion will explain how the ray tracing process was vectorized and gives examples of the images obtained. Author

N84-20232*# Houston Univ., Tex. Dept. of Computer Science.
A KOSLOFF/BASAL METHOD, 3D MIGRATION PROGRAM IMPLEMENTED ON THE CYBER 205 SUPERCOMPUTER
L. D. Pyle and S. R. Wheat (Bell Telephone Labs., Naperville, Ill.) *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 325-358 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

Conventional finite difference migration has relied on approximations to the acoustic wave equation which allow energy to propagate only downwards. Although generally reliable, such approaches usually do not yield an accurate migration for geological structures with strong lateral velocity variations or with steeply dipping reflectors. An earlier study by D. Kosloff and E. Baysal (Migration with the Full Acoustic Wave Equation) examined an alternative approach based on the full acoustic wave equation. The 2D, Fourier type algorithm which was developed was tested by Kosloff and Baysal against synthetic data and against physical model data. The results indicated that such a scheme gives accurate migration for complicated structures. This paper describes the development and testing of a vectorized, 3D migration program for the CYBER 205 using the Kosloff/Baysal method. The program can accept as many as 65,536 zero offset (stacked) traces. B.W.

N84-20233*# SOHIO Petroleum Co., San Francisco, Calif.
VECTORIZATION OF A PENALTY FUNCTION ALGORITHM FOR WELL SCHEDULING
Ilyas Absar *In* NASA. Goddard Space Flight Center CYBER 200 Appl. Seminar Mar. 1984 p 359-370 refs (For primary document see N84-20208 10-61)
Avail: NTIS HC A15/MF A01 CSCL 09B

In petroleum engineering, the oil production profiles of a reservoir can be simulated by using a finite gridded model. This profile is affected by the number and choice of wells which in turn is a result of various production limits and constraints including, for example, the economic minimum well spacing, the number of drilling rigs available and the time required to drill and complete a well. After a well is available it may be shut in because of excessive water or gas productions. In order to optimize the field performance a penalty function algorithm was developed for scheduling wells. For an example with some 343 wells and 15 different constraints, the scheduling routine vectorized for the CYBER 205 averaged 560 times faster performance than the scalar version. Author

N84-20234# University of Southern California, Los Angeles. Dept. of Computer Science.
AdaReL: A RELATIONAL EXTENSION OF ADA Technical Report
Ellis Horowitz and Alfons Kemper 1983 30 p
(Grant AF-AFOSR-0232-82; AF Proj. 2304)
(AD-A137108; AFOSR-83-1309TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

In this paper the authors extend Ada to facilitate the programming of data-intensive applications. The language extensions are based upon the relational data model. The system is interfaced to a relational database management system via a new Ada type relation. The language includes basic operations on relations, commonly available in database query languages, like retrieval of data, update of tuples as well as high-level operators to combine relations to form new ones. The authors show how Ada exception handling is naturally extended to allow integrity control of the relations. In addition the authors discuss language features that enable the sharing of data among several users. Concluding the paper the authors give an extensive example application to demonstrate the power of their proposed language extensions. Author (GRA)

N84-20235# University of Southern California, Los Angeles. Dept. of Computer Science.
PROGRAMMING PRODUCTIVITY ENHANCEMENT BY THE USE OF APPLICATION GENERATORS Interim Report, 1 Jun. - 1 Nov. 1983
Ellis Horowitz Nov. 1983 6 p
(Grant AF-AFOSR-0232-82; AF Proj. 2304)
(AD-A137124; AFOSR-83-1331TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This research was initiated in June 1982. The early work began with an investigation of commercially available application generators. This was undertaken because of a belief that such systems provide a major increase in programming productivity, at least for a narrow range of 'edp' applications. The plan called for investigating systems such as RAMIS, NOMAD and FOCUS with the goal of determining what features contributed to this improvement. The investigators were successful in that they isolated what they believe to be the major features that contribute to increased programming productivity, namely an application generator's built-in interface to a database management system, its non-procedural programming language constructs, and the high-level operators for specific operations. The main activity during the previous nine months has been to see if the investigators could design these features into a general purpose programming language. They decided to use Ada as the starting point. They needed to design an extension of Ada that permits the language to interface with a database management system. They concluded that this interface should not merely be a set of remote procedure calls, but a true extension of the language. This implied that they had to extend the type facility and provide new operators, while preserving the design principles of the language. This is the logical first step towards their goal of incorporating true application generator features into a conventional programming language. This report summarizes the work in this area during this period. GRA

N84-20236# Desmatics, Inc., State College, Pa.
DESIGN OF EXPERIMENTS IN SIMULATION
D. E. Smith and C. A. Mauro Jan. 1984 35 p
(Contract N00014-79-C-0650)
(AD-A137229; TR-113-13) Avail: NTIS HC A03/MF A01 CSCL 09/2

In many cases a simulation study may be viewed as an experimental situation in which a number of factors (independent variables) are to be investigated. There are, however, a number of special characteristics that distinguish simulation experiments from statistical experiments in general. In this paper we discuss three topics which we feel are of particular interest and relevance in the simulation context. These are: (1) Identification of the important factors (i.e., input variables); (2) Investigation of the statistical relationship between the output and input variables; (3) Determination of the combination of factor levels for which the response (i.e., output variable) is optimized; and (4) The use of variance reduction techniques. Author (GRA)

N84-20237# Naval Ocean Systems Center, San Diego, Calif.
COMPUTING CONFIDENCES IN TACTICAL RULE-BASED SYSTEMS BY USING DEMPSTER-SHAFER THEORY
R. A. Dillard 14 Sep. 1983 94 p
(AD-A137274; NOSC/TD-649) Avail: NTIS HC A05/MF A01 CSCL 12/1

This report describes the implementation of confidence computing methods based on Dempster-Shafer Theory. The theory is applicable to tactical decision problems that can be formulated in terms of sets of mutually exclusive and exhaustive

propositions. Dempster's combining procedure, a generalization of Bayesian inference, is used to combine probability mass assignments supplied by independent bodies of evidence. The computing procedures are implemented in the rule-based system ROSIE, and apply to all valid mass assignments. An ordering strategy is used to combine various kinds of assignments by using different procedures that exploit the special features of each. Applications to platform typing and contact association are demonstrated.
Author (GRA)

N84-20238# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Chemical Engineering.
SOLUTION OF DYNAMIC OPTIMIZATION PROBLEMS BY SUCCESSIVE QUADRATIC PROGRAMMING AND ORTHOGONAL COLLOCATION Interim Technical Report
Lorenz T. Biegler 14 Dec. 1983 20 p
(AD-A137338; CMU-RI-TR-83-24) Avail: NTIS HC A02/MF A01 CSCL 12/1

Optimal control and estimation problems are currently solved by embedding a differential equation solver into the optimization strategy. The optimization algorithm chooses the control profile, or parameter estimates, and requires the differential equation routine to solve the equations and evaluate the objective and constraint functionals at each step. Two popular methods for optimal control that follow this strategy are Control Vector Iteration (CVI) and Control Vector Parameterization (CVP), CVI requires solution of the Euler-Lagrange equations and minimization of the Hamiltonian while CVP involves repeated differential equation solutions driven by direct search optimization. Both methods can be prohibitively expensive even for small problems because they tend to converge slowly and require solution of differential equations at each iteration. The author introduces a method that avoids this requirement by simultaneously converging to the optimum while solving the differential equations. To do this, he applies orthogonal collocation to the system of differential equations and convert them into algebraic ones. He then applies an optimization strategy that does not require satisfaction of equality constraints at each iteration. Here the method is applied to a small initial value optimal control problem, although he is by no means restricted to problems of this type.
Author (GRA)

N84-20239# Royal Signals and Radar Establishment, Malvern (England).
THE USE OF THE MASCOT PHILOSOPHY FOR THE CONSTRUCTION OF ADA PROGRAMS
G. Fickenscher Oct. 1983 120 p
(AD-A137417; RSRE-83009; DRIC-BR-90207) Avail: NTIS HC A06/MF A01 CSCL 09/2

The development of computer based systems poses major problems on the people involved. Both, MASCOT (the official design methodology of the UK Ministry of Defence for real-time systems) and Ada (the official programming language of the US Department of Defence for embedded computer systems) claim to offer a solution to the majority of these problems. MASCOT is a programming support environment which is independent of a particular programming language, but it defines its own runtime kernel for parallel execution of different program parts. Ada, on the other hand, offers language constructs to express parallelism of program parts, but Ada enforces a particular design methodology with its language rules. This paper investigates whether it is feasible to combine the MASCOT methodology with the programming language Ada. It demonstrates a possible implementation of a MASCOT Construction Data Base in Ada, and it explains the combination of MASCOT and Ada by using a simple example.
Author (GRA)

N84-20240# Softech, Inc., Waltham, Mass.
INTEGRATED COMPUTER-AIDED MANUFACTURING (ICAM) ARCHITECTURE. PART 3, VOLUME 2: PROCEDURES Final Report, Sep. 1980 - Jun. 1982
Stan Smith, Bette Davis, Richard Heine (Rockwell International Corp.), and Chuck Martin (D. Appleton Co.) Wright-Patterson AFB, Ohio AFWAL Sep. 1983 101 p 8 Vol.
(Contract F33615-80-C-5109)
(AD-A137422; FTR110410000U-Pt-3-Vol-2; Rept-1080-Pt-3-Vol-2-31; AFWAL-TR-82-4063-Pt-3-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 09/2

The Integrated Computer Aided Manufacturing (ICAM) Architecture Part 3 was initiated to maintain and update the existing manufacturing architecture as well as develop training courses to assist in the transition of IDEF applications, concepts and procedures to other Air Force programs. This volume details the Arrow Trace Procedure, IDEF0 Integration Procedure and IDEF1 Integration Procedure.
GRA

N84-20241# Army Materials and Mechanics Research Center, Watertown, Mass.
DSP1, A DIFFRACTOMETER SUBROUTINE PACKAGE FOR PDP-8 COMPUTERS Final Report
C. B. Walker Nov. 1983 37 p
(AF Proj. 1L1-61102-AH-42)
(AD-A137458; AMMRC-TR-83-59) Avail: NTIS HC A03/MF A01 CSCL 09/2

The AMMRC diffractometer subroutine package, DSP1, was developed to allow a PDP-8 computer with a 4K memory to control a 4-axis X-ray diffractometer in a variety of step scan and integrated intensity measurements in the AMMRC program of materials research. It is used in conjunction with the AMMRC floating point package, FPP1, which it uses for all calculations, input, and output. The general functions of DSP1 include storage and retrieval of scan parameters, conversion of reciprocal space coordinates (for cubic systems) into shaft angle settings, anti-backlash shaft positioning, and fixed time/fixed count X-ray counting (with dead time correction), plus bookkeeping and manipulation to repeat measurements for scans with either one (1-D) or two (2-D) sets of increments. It is composed of 40 subroutines ranging from simple wait loops to complex operations, with the addresses of 31 of these listed on page 0 for easy access, plus a minimal interrupt routine. It also includes a few examples of programs for standard types of measurements. The DSP1 package occupies 978 words of memory, thus, DSP1 and FPP1 together occupy 2079 words, leaving approximately half the 4K memory available for data storage and other programming. As with FPP1, linkages for multiple field operations are left to users with more experience in extended memory systems.
GRA

N84-20242# Naval Postgraduate School, Monterey, Calif.
A USER-ORIENTED MICROPROCESSOR SHELL COMMAND LANGUAGE INTERPRETER M.S. Thesis
Dennis J. Ritaldato and David J. Smania Sep. 1983 117 p
(AD-A136809; AD-E301284) Avail: NTIS HC A06/MF A01 CSCL 09/2

The design of a microprocessor command language, RSCL, is discussed. RSCL provides the capability of building variable shell environments on a standard microprocessor system. These environments present a menu driven, screen oriented user interface as opposed to the line oriented interface of current operating systems. The RSCL is a straightforward, easily understandable and complete computer programming language. Designed according to specific command language guidelines, it allows the user to make maximum utility of his skills. A prototype implementation and sample program runs are included. These illustrate the design features and serve as a test platform for future research.
Author (GRA)

N84-20243# Naval Postgraduate School, Monterey, Calif.
SIMTBED: A GRAPHICAL TEST BED FOR ANALYZING AND REPORTING THE RESULTS OF A STATISTICAL SIMULATION EXPERIMENT M.S. Thesis
Hans-Walter Drueg Sep. 1983 159 p
(AD-A136812; AD-E301284) Avail: NTIS HC A08/MF A01 CSCL 09/2

A graphical test bed in which the results of a simulation experiment can be reported and analyzed is described. The test bed is based on the regression adjusted graphics and estimation methodology developed by Heidelberger and Lewis for regenerative

simulation. From the graphics and associated numerics, the experimenter can summarize and see simultaneously relative properties, such as bias, normality and standard deviation, of several estimators of a characteristic of a population for up to 8 sample sizes. The evolution of these properties with sample size is also displayed. The graphics is supported on a line printer to make it and the program portable. The technique is illustrated by examples concerning the effects of changes in data distribution on the behavior of the lag one serial correlation coefficient, the estimation of the shape parameter of Gamma random variables and a comparison of different methods (jackknife, bootstrap) for estimating the standard error of an estimator. Author (GRA)

N84-20244# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.
COMPUTER GENERATION OF PLAN OF ACTION AND MILESTONE SCHEDULE Final Report
A. Shuford and S. Becker Nov. 1983 83 p
(AD-A137057; DTNSRDC-CMLD-83/27) Avail: NTIS HC A05/MF A01 CSCL 09/2

The Computer Generated Plan of Action and Milestones (POAM) Program was developed to generate a Plan of Action and Milestones Chart using computer graphics. These charts are used in reports and system Decision Papers. The charts show the progress and methodology of a project. The original charts were generated by hand (ruler and pencil with a final typed copy) and by graphics procedures. The computer program will enable the user to generate these graphs faster, and more efficiently. The program uses Fortran, and Display Integrated Software System and Plotting Language (DISSPLA). DISSPLA is a software package that enables the user to produce graphics. The user is advised to become familiar with the introductory portions of the DISSPLA manual. This manual explains how POAMs are produced through interactive and batch computer methods. GRA

N84-20245# Syracuse Univ., N. Y. School of Computer and Information Science.
LOGIC PROGRAMMING AND KNOWLEDGE BASE MAINTENANCE Annual Report, 1 Sep. 1982 - 31 Aug. 1983
Kenneth A. Bowen Nov. 1983 7 p
(Grant AF-AFOSR-0292-82; AF Proj. 2304)
(AD-A137062; AFOSR-84-0005TR) Avail: NTIS HC A02/MF A01 CSCL 06/4

The work conducted this year followed the projections set forth in the grant proposal rather closely. On the theoretical side, the investigators have continued to explore questions of the logical status of some of the standard data structures involved in various artificial intelligence applications involving knowledge bases. The greatest attention has been focused on frames. Exploration of the axiomatization and representation of semantic nets by similar methods has been carried out. The nodes of the net are treated by methods similar to frames. Most of the attention here has focused on the work of Woods and Brachman and the KLONE formalism. The investigators have conducted a number of explorations with their existing experimental metaProlog simulator. This simulation was coded in Edinburgh Prolog and run on Syracuse University's DEC-10 computer. Progress in these areas is discussed in greater detail in this interim report. Author (GRA)

N84-20246# Maryland Univ., College Park. Dept. of Computer Science.
PARALLEL LOGIC PROGRAMMING AND ZMOB AND PARALLEL SYSTEMS SOFTWARE AND HARDWARE Interim Report, 1 Jun. 1982 - 15 Sep. 1983
Jack Minker and Mark Weiser Sep. 1983 11 p
(Grant AF-AFOSR-0303-82; AF Proj. 2304)
(AD-A137068; AFOSR-84-0004TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The purpose of this letter is to discuss our research into parallel systems software and hardware, and parallel problem solving. Under the current grant, a detailed design and partial implementation of a parallel problem solving system, PRISM (parallel inference system), based on logic was achieved. The PRISM requires that the ZMOB parallel processor be available for use. In addition, systems software and hardware have been developed. It is estimated that ZMOB will become available for use during the Fall of 1983. Hence, a full test and debugging of PRISM cannot be achieved under the current grant. At the end of the current grant we expect to have accomplished, as a minimum, all of the objectives proposed. That is, in the area of parallel problem solving, the initial PRISM has been fully designed; individual programs have been implemented and tested in a non-parallel environment; and investigations have been made into extensions to the initial design. GRA

N84-20247# Mitre Corp., Bedford, Mass.
SOFTWARE ACQUISITION RESOURCE EXPENDITURE (SARE) DATA COLLECTION METHODOLOGY Final Report
R. L. Dumas Hanscom AFB, Mass. ESD Dec. 1983 136 p
(Contract F19628-82-C-0001)
(AD-A137084; MTR-9031; ESD-TR-83-214) Avail: NTIS HC A07/MF A01 CSCL 09/2

One of the major shortfalls in software cost estimation is the lack of a well-defined, well-structured database. This report is the culmination of a multi-year effort to develop contractual documents to effect quality software data collection on defense programs. It includes as attachments a proposed draft military standard for software work breakdown structures and a data item description for reporting project attributes that impact software cost and schedule. The evolution of the documents is discussed and procedures for implementing data collection on defense programs are provided. Readers are asked to comment on the SARE methodology using a questionnaire provided as the third attachment. Author (GRA)

N84-20248# California Univ., Livermore. Lawrence Livermore Lab.
INTRODUCTION TO GEMINI
R. C. Murray, D. W. Stillman, and R. L. Taylor Dec. 1983 190 p
(Contract W-7405-eng-48)
(DE84-005058; UCID-19947) Avail: NTIS HC A08/MF A01

Slides were prepared to aid in teaching a course on GEMINI usage as part of a computer code series. The course consisted of nine fifty-five minute sessions that were recorded on video tape for TV playback. Copies of the slides used in these sessions are provided. The series covers modeling, static analysis, eigenanalysis response spectra analysis, CRAY GEMINI, and shell element technology. DOE

N84-20249# Los Alamos Scientific Lab., N. Mex.
CRAY/VAX INTERACTIVE GRAPHICS SYSTEM
Donald Leroy Willerton 1983 4 p Presented at the US Fall DECUS Symp., Las Vegas, Nev., 24-28 Oct. 1983
(Contract W-7405-eng-36)
(DE84-003826; LA-UR-83-3397; CONF-8310182-6) Avail: NTIS HC A02/MF A01

A new graphics system was brought into production at Los Alamos National Laboratory that interfaces under codes running on the Cray-1 computers with an Evans and Sutherland Multi Picture System high-speed, high-resolution graphics workstation. The system is described from three points of view: hardware, software, and software functions. Special emphasis is placed on the use of detached processes, global sections, and event flag communication. DOE

N84-20250# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
INTERACTIVE PARALLEL PROCESSOR FOR DATA ANALYSIS
J. Meng, D. Weaver, C. Maples, W. Rathbun, and D. Logan Oct. 1983 7 p refs Presented at the Nucl. Sci. Symp., San Francisco, 19-22 Oct. 1983
(Contract DE-AC03-76SF-00098)
(DE84-004311; LBL-15958; CONF-831015-32) Avail: NTIS HC A02/MF A01

A parallel array of eight minicomputers was assembled in an attempt to deal with kiloparameter data events. By exporting

computer system functions to a separate processor, computer amplification linearly proportional to the number of executing processors was achieved. The array is highly modular which allows for repair replacement or upgrading of the major components without a long downtime period, thus avoiding obsolescence. DOE

N84-20251# Argonne National Lab., Ill. Mathematics and Computer Science Div.
APPROACH TO PROGRAMMING MULTIPROCESSING ALGORITHMS ON THE DENELCOR HEP
E. L. Lusk and R. A. Overbeek Dec. 1983 22 p refs
(Contract W-31-109-eng-38; Grant NSF MCS-82-07496)
(DE84-005440; ANL-83-96) Avail: NTIS HC A02/MF A01

The basic synchronization primitives of the HEP (i.e., asynchronous variables), form too low-level a conceptual basis for the formulation of multiprocessing algorithms. The use of monitors, easily implemented by using the HEP primitive, was proposed. Attempts to solve substantial problems without introducing higher-level constructs such as monitors can produce a code that is unreliable, unintelligible, and restricted to the specific dialect of FORTRAN currently supported on the HEP. Experience shows that solutions which are both clear and efficient are formulated using monitors. DOE

N84-20252# California Univ., Livermore. Lawrence Livermore Lab.
BIMOND: MONOTONE BIVARIATE INTERPOLATION CODE (PRELIMINARY DOCUMENTATION)
F. N. Fritsch and R. E. Carlson Dec. 1983 28 p refs
(Contract W-7405-eng-48)
(DE84-004159; UCID-30197) Avail: NTIS HC A03/MF A01

Preliminary documentation for BIMOND, a FORTRAN 77 subroutine for piecewise bicubic interpolation to data on a rectangular mesh, which reproduces the monotonicity of the data is presented. A driver program BIMOND 1, which reads data was distributed, computes the interpolating surface parameters, and evaluates the function on a mesh suitable for plotting. DOE

N84-20253# California Univ., Livermore. Lawrence Livermore Lab.
THREE-DIMENSIONAL GRAPHICS FOR SCIENTIFIC DATA DISPLAY AND ANALYSIS
S. L. Grotch Dec. 1983 28 p refs Presented at NATO Advan. Study Inst.: Chemometric, Cosenza, Italy, 1 Sep. 1983
(Contract W-7405-eng-48)
(DE84-004075; UCRL-90099; CONF-8309191-1) Avail: NTIS HC A03/MF A01

Techniques for displaying scientific data in three dimensions are examined using a variety of real examples. Among the types of plots illustrated are: three dimensional scatterplots, combined surface/contour plots, and combined surface/point displays. A variety of useful features which will enhance the utility of these plots is illustrated. Such displays have proved extremely valuable in providing insights into many problems of chemometrics in that these techniques allow the representation of a chemical concentration or property as a function of both time and temperature. DOE

N84-20254# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
THE PASCAL PLUS (PAP) PREPROCESSOR: A PRECOMPILER FOR A LANGUAGE FOR CONCURRENT PROCESSING ON A MULTIPROCESSOR SYSTEM
W. J. M. Lemmens Oct. 1982 41 p refs
(EUT-82-E-130; ISBN-90-6144-130-7; ISSN-0167-9708) Avail: NTIS HC A03/MF A01

The design, implementation and use of a language for concurrent processing on a multiprocessor computer system are described. A user's manual and implementation notes are included. Advantages and disadvantages of using a preprocessor in addition to a compiler for the translation of programs written in such a language are discussed. Author (ESA)

N84-20255# Research Inst. of National Defence, Umea (Sweden). Dept. 4.
DARK: A COMPUTER BASED SYSTEM FOR SIMULATING THE POTENTIAL HAZARDS FROM RELEASES OF PRESSURIZED GASES
Jan-Olof Andersson, Aake Boxvall, Edvard Karlsson, Nils Karlsson, Kenneth Nyren, Lars Rejnus, and Stellan Winter Oct. 1983 77 p refs In SWEDISH; ENGLISH summary
(FOA-C-40183-C2; ISSN-0347-2124) Avail: NTIS HC A05/MF A01

The DARK system was developed for estimating injury to people from pressurized toxic gas releases. The system is based on mathematical models of gas release and toxicity. Interactions between gas quantity, temperature, type of release, weather, distance from release point, and indoors or outdoors were analyzed statistically. All factors have a strong effect and interact in a very complex way. Author (ESA)

N84-20256# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
CONTROL DATA CORPORATION CYBER 205 MODEL 442 200 (G201-25) Validation Summary Report
May 1983 22 p refs
(PB84-137421; OSD/FSTC-83/140) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Control Data Corporation, FORTRAN 200 (G201-25) running under the VSOS 2.1 Level 592 (G201-01) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N84-20257# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
SDC/A BURROUGHS CORPORATION B94 CMS SYSTEM CMS COBOL RELEASE 3.05 Validation Summary Report
5 Sep. 1983 47 p
(PB84-140235; OSD/FSTC-83/230) Avail: NTIS HC A03/MF A01 CSCL 09B

A consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1) was completed. The compiler was validated against the Low level of FIPS PUB 21-1. Several sections show all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-19426# European Space Research and Technology Center, Noordwijk (Netherlands).
ESATAN: A THERMAL NETWORK ANALYSIS COMPUTER PROGRAM
W. Lebrun, J. N. Loughhead (GEC, Whetstone, England), G. A. Miles, C. Stroom, and J. R. Turner (GEC, Whetstone, England) *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 249-257 (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-19629*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SIMULATIONS FOR FULL UNIT-MEMORY AND PARTIAL UNIT-MEMORY CONVOLUTIONAL CODES WITH REAL-TIME MINIMAL-BYTE-ERROR PROBABILITY DECODING ALGORITHM
Q. D. Vo *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1984 p 77-85 refs (For primary document see N84-19621

10-32)
Avail: NTIS HC A10/MF A01 CSCL 09B

N84-19875# Morrow (Charles T.), Encinitas, Calif.
SHOCK SPECTRAL ANALYSIS BY PERSONAL COMPUTER, USING THE IFT ALGORITHM
Charles T. Morrow *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 97-102 refs (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 09/2

N84-19878# Computer Sciences Corp., Houston, Tex.
EFFICIENT ALGORITHMS FOR CALCULATING SHOCK SPECTRA ON GENERAL PURPOSE COMPUTERS
Frank W. Cox *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Part 1 May 1983 p 143-161 (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 09/2

N84-19904# Harris Corp., Melbourne, Fla. Information Systems Div.
VIBRATION TEST SOFTWARE FOR ELECTRONICS MOUNTED IN A REMOTELY PILOTED VEHICLE
S. M. Landre *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 135-141 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 09/2

62 COMPUTER SYSTEMS

Includes computer networks.

N84-20258*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OPERATING SYSTEM FOR A REAL-TIME MULTIPROCESSOR PROPULSION SYSTEM SIMULATOR
Gary L. Cole 1984 11 p refs To be presented at the Summer Computer Simulation Conf., Boston, 23-25 Jul. 1984
(NASA-TM-83605; E-2023; NAS 1.15:83605) Avail: NTIS HC A02/MF A01 CSCL 09B

The success of the Real Time Multiprocessor Operating System (RTMPOS) in the development and evaluation of experimental hardware and software systems for real time interactive simulation of air breathing propulsion systems was evaluated. The Real Time Multiprocessor Operating System (RTMPOS) provides the user with a versatile, interactive means for loading, running, debugging and obtaining results from a multiprocessor based simulator. A front end processor (FEP) serves as the simulator controller and interface between the user and the simulator. These functions are facilitated by the RTMPOS which resides on the FEP. The RTMPOS acts in conjunction with the FEP's manufacturer supplied disk operating system that provides typical utilities like an assembler, linkage editor, text editor, file handling services, etc. Once a simulation is formulated, the RTMPOS provides for engineering level, run time operations such as loading, modifying and specifying computation flow of programs, simulator mode control, data handling and run time monitoring. Run time monitoring is a powerful feature of RTMPOS that allows the user to record all actions taken during a simulation session and to receive advisories from the simulator via the FEP. The RTMPOS is programmed mainly in PASCAL along with some assembly language routines. The RTMPOS software is easily modified to be applicable to hardware from different manufacturers. M.A.C.

N84-20259*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RTMPL: A STRUCTURED PROGRAMMING AND DOCUMENTATION UTILITY FOR REAL-TIME MULTIPROCESSOR SIMULATIONS
Dale J. Arpasi 1984 8 p ref To be presented at the Summer Computer Simulation Conf., Boston, 23-25 Jul. 1984
(NASA-TM-83606; E-2025; NAS 1.15:83606) Avail: NTIS HC A02/MF A01 CSCL 09B

The NASA Lewis Research Center is developing and evaluating experimental hardware and software systems to help meet future needs for real time simulations of air-breathing propulsion systems. The Real Time Multiprocessor Simulator (RTMPS) project is aimed at developing a prototype simulator system that uses multiple microprocessors to achieve the desired computing speed and accuracy at relatively low cost. Software utilities are being developed to provide engineering-level programming and interactive operation of the simulator. Two major software development efforts were undertaken in the RTMPS project. A real time multiprocessor operating system was developed to provide for interactive operation of the simulator. The second effort was aimed at developing a structured, high-level, engineering-oriented programming language and translator that would facilitate the programming of the simulator. The Real Time Multiprocessor Programming Language (RTMPL) allows the user to describe simulation tasks for each processor in a straight-forward, structured manner. The RTMPL utility acts as an assembly language programmer, translating the high-level simulation description into time-efficient assembly language code for the processors. The utility sets up all of the interfaces between the simulator hardware, firmware, and operating system. Author

N84-20260# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Control Engineering.
MARKOVIAN MODELS OF A TRANSACTIONAL SYSTEM SUPPORTED BY CHECKPOINTING AND RECOVERY STRATEGIES. PART 1: A MODEL WITH STATE-DEPENDENT PARAMETERS
V. F. Nicola Aug. 1982 34 p refs 2 Vol.
(EUT-82-E-128-Pt-1; ISBN-90-6144-128-5; ISSN-0167-9708) Avail: NTIS HC A03/MF A01

A Markovian model of a transactional system supported with checkpointing and recovery strategies to guarantee reliable operation is considered. The model allows representations with state-dependent parameters. Algorithms for the computation of the state probabilities (and thus the performance variables) and their sensitivities with respect to the model parameters are presented. In the case of state-independent parameters, a state-space analysis approach is demonstrated for the derivation of analytic expressions for the performance variables. Optimization of system availability and the mean response time of a transaction is discussed. Author (ESA)

N84-20261# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
MARKOVIAN MODELS OF A TRANSACTIONAL SYSTEM SUPPORTED BY CHECKPOINTING AND RECOVERY STRATEGIES. PART 2: AA MODEL WITH A SPECIFIED NUMBER OF TRANSACTIONS BETWEEN CHECKPOINTS
V. F. Nicola Aug. 1982 50 p refs 2 Vol.
(EUT-82-E-129-Pt-2; ISBN-90-6144-129-3; ISSN-0167-9708) Avail: NTIS HC A03/MF A01

A Markovian model for checkpointing and rollback recovery in a transactional system, in which checkpoints are performed after the processing of a specified number of transactions, is considered. Failures may occur during any of the different modes of operation of the system. The limiting state probabilities can be recursively expressed in terms of a finite set of boundary state probabilities. The set of boundary state probabilities can be determined by solving a set of linear equations. For heavily and lightly loaded situations, appropriate approximations yield explicit forms for the system availability and the mean response time of a transaction. Author (ESA)

N84-20262# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
JOB HANDLING IN A NETWORK OF DISTRIBUTED PROCESSORS
P. M. C. vandenEijnden, H. M. J. M. Dortmans, J. P. Kemper, and M. P. J. Stevens Oct. 1982 36 p refs

(EUT-82-E-131; ISBN-90-6144-131-5; ISSN-0167-9708) Avail: NTIS HC A03/MF A01

A completely distributed modular computer system composed of processing units which can perform specified tasks independently was developed. Adding intelligence to peripheral devices, by microprocessors and buffer memories, provides for independent functioning of these peripherals. The devices are connected by a nonblocking communication network, and to a central facility containing the operating system. The operating system is distributed over a number of cooperating modules. Each operating system module supports one intelligent device. The operating system modules control the load among the devices and see to the correct processing of jobs presented by a user. Each is equipped with its own buffer capacities and processing power. The network that interconnects the operating system modules has the same structure as that linking the devices.

Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N84-20263# Oxford Univ. (England). Dept. of Engineering Science.

ON OPTIMALITY OLF CONTROL

R. Gessing (Silesian Technical University, Poland) and O. L. R. Jacobs 1983 22 p refs Sponsored by British Council

(OUEL-1493/83) Avail: NTIS HC A02/MF A01

Conditions under which suboptimal open loop feedback control is identical with optimal stochastic control are discussed. Equivalence conditions are formulated and proved. For individual titles, see N84-20264 through N84-20265.

N84-20264# Oxford Univ. (England). Dept. of Engineering Science.

ON EQUIVALENCE BETWEEN OPTIMAL STOCHASTIC CONTROL AND OPEN-LOOP FEEDBACK CONTROL

R. Gessing (Silesian Technical University, Poland) and O. L. R. Jacobs *In its* On Optimality of OLF Control 1983 4 p refs Sponsored by British Council (For primary document see N84-20263 10-63)

Avail: NTIS HC A02/MF A01

Conditions under which suboptimal loop feedback control is identical with optimal stochastic control are discussed. The significance of information structure is emphasized and notations for its discussion in stochastic control problems are provided. A lemma about equivalence between the two controls is formulated and used to obtain sufficient conditions for the equivalence in linear quadratic (LQ) problems. It is shown that the equivalence exists in a generalized class of LQ Gaussian problems and also in a class of LQ problems having generalized disturbances and complete state information. Author (ESA)

N84-20265# Oxford Univ. (England). Dept. of Engineering Science.

ABOUT EQUIVALENCE BETWEEN CLOSED-LOOP AND OPEN-LOOP FEEDBACK CONTROLS

R. Gessing (Silesian Technical University, Poland) and O. L. R. Jacobs *In its* On Optimality of OLF Control 1983 5 p refs Sponsored by British Council (For primary document see N84-20263 10-63)

Avail: NTIS HC A02/MF A01

Conditions of equivalence of the closed loop and open loop feedback control strategies are formulated and proved. For the linear quadratic (LQ) problem the conditions concern covariance matrices of the estimation errors. It is shown that for a general class of LQ Gaussian problems both the strategies are equivalent. The equivalence also exists in the case of LQ problem with complete state information and any disturbances in the form of stochastic processes of the second order. Author (ESA)

N84-20266# University of Southern California, Marina del Rey. Information Sciences Inst.

EXTENDING GRAMMARS TO NEW DOMAINS

Jane J. Robinson Jan. 1984 63 p

(Contract F49620-79-C-0181; Grant NSF MCS-78-07410)
(AD-A137110; ISI/RR-83-123) Avail: NTIS HC A04/MF A01 CSCL 06/4

This is the report of an undertaking to extend and adapt an existing grammar, DIAGRAM, to provide the syntactic analysis of sentences in a new domain. DIAGRAM is an augmented phrase-structure grammar whose rules provide a means for associating semantic and domain dependent interpretations with a syntatic analysis. An earlier version, used for the syntactic analysis and the interpretation of spoken English, covered the vocabulary and basic phrase types needed to query a static data base of information about naval ships. The new domain in which the extended and adapted version has been tested is represented by a set of eighteen dialogues, called Helper dialogues, in which computer users present their problems to the operator and ask for help. Extending the syntax to cover the new words and phrase types exhibited in these sample texts raises a number of questions of general theoretical interest along with problems that can properly be construed as artifacts of the particular grammar that is being extended or of the limitations of the parsing program and the computer system in which the grammar is applied to input sentences. This report therefore can be read with both a broad and a narrow scope. The narrow scope reading is concerned with the additions and revisions that were made to DIAGRAM in order to parse the sentences in the dialogues selected from the new domain. The broad scope reading is concerned with the kinds of problems encountered in extending syntatic coverage generally and with strategies for coping with them. Author (GRA)

N84-20267# Army War Coll., Carlisle Barracks, Pa.

ARTIFICIAL INTELLIGENCE APPLIED TO THE COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE OF THE US CENTRAL COMMAND

J. N. Enyart 6 Jun. 1983 81 p Original contains color illustrations

(AD-A137205) Avail: NTIS HC A05/MF A01 CSCL 17/2

This study offers commanders and managers an operational perspective of the steadily evolving technology of artificial intelligence (AI). This primer discusses AI within the context of its probable future application to command, control, communications, and intelligence (C3I). The technological advances in command, control, and intelligence collection and communications capabilities the concurrent inundation of data into command facilities, and the limited number of experienced personnel available to analyze the material are the catalysts to investigate the current as well as future assistance that may be available through AI systems. And as it will be pointed out, the human contribution to this environment is key to the success of AI systems. In order for the reader to better understand the differences between current conventional computer services and those that capitalize on AI techniques, a little background as well as some fundamental building blocks of this newly emerging art are introduced. GRA

N84-20268# Yale Univ., New Haven, Conn. Dept. of Computer Science.

TIME MAP MAINTENANCE Technical Report

T. Dean Oct. 1983 80 p

(Contract N00014-83-K-0281)
(AD-A137236; YALE/U/CSD/RR-289) Avail: NTIS HC A05/MF A01 CSCL 09/2

This paper describes a mechanism for dealing with the representation of events and their effects occurring in and over time. The mechanism, which I refer to as a time map manager, is shown to be useful in problem solvers requiring an ability to reason about time and causality. In addition to describing the theory and its implementation I will demonstrate a programming technique

and related discipline based upon the use of data dependencies. This technique supports the design of complex control structures capable of recording the conditions under which information is stored and subsequently responding in highly directed ways when those conditions are changed. Author (GRA)

N84-20269# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
AUTOMATIC PLANNING OF FINE MOTIONS: CORRECTNESS AND COMPLETENESS Interim Report
Matthew T. Mason 14 Dec. 1983 32 p
(AD-A137355; CMU-RI-TR-83-18) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper explores a method for automatic planning of robot fine-motion programs, first described in another paper. The primary result is a variation that is shown to be bounded-complete. The method obtains a solution whenever a solution consisting of a bounded number of motions exists. Author (GRA)

N84-20270# SRI International Corp., Menlo Park, Calif. Artificial Intelligence Center.
RESEARCH ON INTERACTIVE ACQUISITION AND USE OF KNOWLEDGE Final Report, 3 Jul. 1980 - 30 Nov. 1983
Barbara J. Grosz and M. E. Stickel Nov. 1983 208 p
(Contract N00039-80-C-0575; SRI Proj. 1894)
(AD-A137436) Avail: NTIS HC A10/MF A01 CSCL 09/2

This report summarizes research done on the KLAUS project from July 1981 to July 1983. In July 1980 we began work on the second KLAUS system, called MICROKLAUS, and on the technological base needed to support it. Our initial experience with MICROKLAUS led us to redesign the parsing and translation system to provide for a declarative semantics that is easier both to extend and to maintain, and to augment the deduction system along a number of dimensions. These development efforts proceeded independently, with the natural-language-processing and deduction components being only recently rejoined. We have also made significant progress on several fundamental problems of natural-language semantics and on specifying the planning and reasoning capabilities needed for generating adequate responses. Our systems have been moved from the DEC 2060 to the Symbolics 3600 LISP machine. We expect these new components to provide the core of a new KLAUS system with significantly more powerful capabilities for communication in natural language. The base they provide also leaves us in a position to attack several fundamental research problems holding back the development of advanced KLAUS systems and other types of advanced systems that require high-quality natural-language capabilities. GRA

N84-20271# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Control Engineering.
TIME OPTIMAL CONTROL OF A CRANE
H.H. Vandeven Apr. 1983 64 p refs
(EUT-83-E-135; ISBN-90-6144-135-8; ISSN-0167-9708) Avail: NTIS HC A04/MF A01

Time optimal control of a hoisting crane, by open loop control systems based on Pontryagin's maximum principle, and on the pattern of the phase trajectories is discussed. Two methods to determine the time optimal switching intervals in a closed loop control system are derived. In the first method an analytic approach is used to calculate the switching surfaces; in the second the time optimal switching intervals are predicted by a fast model. It is demonstrated that the state of the crane can be estimated by a modified Kalman filter. Author (ESA)

N84-20272 California Univ., Berkeley.
A LEARNING ADAPTIVE CONTROLLER Ph.D. Thesis
Maamar Zoubeidi 1983 142 p
Avail: Univ. Microfilms Order No. DA8329109

The performance of a process under control often deteriorates because of the presence of unknown disturbances in the environment or because of variations in the process parameters. A learning adaptive controller (LAC) using MRAS algorithm was derived to control a time varying process operating in a noisy environment. It identified the type of disturbance acting on the process as well as the best control strategy (in a probabilistic sense) that eliminated the effect of the disturbance. First, it is shown that either of the disturbances can be identified and recognized by their spectrum; then, a decision process which selects the best control strategy was derived. The different probabilities used in this decision process were generated during the system operation, and they were shown to converge to a set of values which assure a reliable decision rule. Three control strategies were considered: (1) closed loop adaptation; (2) open loop identification then adaptation; (3) no action. The adaptation strategies will be implemented when the disturbance is identified as internal. The no action strategy, which does not implement any adaptive control action, will be used when the disturbance is identified as external. Dissert. Abstr.

N84-19433# Politecnico di Torino (Italy).
ADAPTIVE CONTROL OF THERMAL FLUID LOOPS FOR SPACE APPLICATIONS
V. Marchis and N. Nervegna *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 319-327 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-20273*# Southern Methodist Univ., Dallas, Tex.
ESTIMATION OF DISCONTINUOUS COEFFICIENTS IN PARABOLIC SYSTEMS: APPLICATIONS TO RESERVOIR SIMULATION Final Report
Patricia Daniel Lamm Feb. 1984 56 p refs
(Contracts NAS1-17130; NAS1-16394; Grants NAG1-258; NSF MCS-82-00883)
(NASA-CR-172301; NAS 1.26:172301) Avail: NTIS HC A04/MF A01 CSCL 12A

Spline based techniques for estimating spatially varying parameters that appear in parabolic distributed systems (typical of those found in reservoir simulation problems) are presented. The problem of determining discontinuous coefficients, estimating both the functional shape and points of discontinuity for such parameters is discussed. Convergence results and a summary of numerical performance of the resulting algorithms are given. Author

N84-20274*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTRAL METHODS IN TIME FOR HYPERBOLIC EQUATIONS Final Report
Hillel Tal-Ezer (Tel-Aviv Univ.) Feb. 1984 35 p refs
(Contracts NAS1-17070; DAJA38-80-C-0032)
(NASA-CR-172302; ICASE-84-8; NAS 1.26:172302) Avail: NTIS HC A03/MF A01 CSCL 12A

A pseudospectral numerical scheme for solving linear, periodic, hyperbolic problems is described. It has infinite accuracy both in time and in space. The high accuracy in time is achieved without increasing the computational work and memory space which is needed for a regular, one step explicit scheme. The algorithm is shown to be optimal in the sense that among all the explicit algorithms of a certain class it requires the least amount of work to achieve a certain given resolution. The class of algorithms referred to consists of all explicit schemes which may be represented as a polynomial in the spatial operator. Author

N84-20275*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NEWTON LIKE: MINIMAL RESIDUAL METHODS APPLIED TO TRANSONIC FLOW CALCULATIONS Final Report
Yau Shu Wong (McGill Univ.) Feb. 1984 34 p refs
(Contracts NAS1-15810; NAS1-16394)
(NASA-CR-172305; ICASE-84-9; NAS 1.26:172305) Avail: NTIS HC A03/MF A01 CSCL 12A

A computational technique for the solution of the full potential equation is presented. The method consists of outer and inner iterations. The outer iterate is based on a Newton like algorithm, and a preconditioned Minimal Residual method is used to seek an approximate solution of the system of linear equations arising at each inner iterate. The present iterative scheme is formulated so that the uncertainties and difficulties associated with many iterative techniques, namely the requirements of acceleration parameters and the treatment of additional boundary conditions for the intermediate variables, are eliminated. Numerical experiments based on the new method for transonic potential flows around the NACA 0012 airfoil at different Mach numbers and different angles of attack are presented, and these results are compared with those obtained by the Approximate Factorization technique. Extention to three dimensional flow calculations and application in finite element methods for fluid dynamics problems by the present method are also discussed. The Inexact Newton like method produces a smoother reduction in the residual norm, and the number of supersonic points and circulations are rapidly established as the number of iterations is increased. M.A.C.

N84-20276# Citadel Coll., Charleston, S.C. Dept. of Mathematics and Computer Science.
AN INTERPOLATION AND COMPACTION TECHNIQUE FOR GRIDDED DATA Final Report, 1 Jun. 1982 - 31 May 1983
David L. Cozart 27 Jun. 1983 35 p
(Grant AF-AFOSR-0166-82; AF Proj. 2304)
(AD-A137107; AFOSR-83-1333TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

An interpolation technique is implemented which is applicable to terrain data defined on a rectangular grid. The technique also allows for data compaction, i.e., effectively representing the given data using less space than required by the raw data. The technique involves finding bicubic polynomials which represent the terrain surface over small subgrids. These surfaces are then pieced together to form a global surface which is both continuous and smooth over the entire region. Author (GRA)

N84-20277# Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.
NONLINEAR THEORY OF THE E X B INSTABILITY WITH AN INHOMOGENEOUS ELECTRIC FIELD Interim Report
M. J. Keskinen 9 Jan. 1984 38 p
(S99QMXB)
(AD-A137132; NRL-MR-5235) Avail: NTIS HC A03/MF A01 CSCL 12/1

Using analytical and numerical techniques, the nonlinear evolution of the E x B instability with an inhomogeneous electric field has been studied. For the case where the electric field component parallel to the density gradient is inhomogeneous, the author finds that the inhomogenous E x B instability in the nonlinear regime (1) destabilizes short wavelength linear stable modes, (2) evolves into large scale anisotropic finger-like structures, (3) can be described by power laws, P(k sub x) varies as k sub x (-n)x, n sub x asymptotically equal 2, P(k sub y) varies as k sub y (-n) sub y, n sub y asymptotically equal 2-3 where P(k sub x) and P(k sub y) are the one dimensional power spectra parallel and perpendicular to the initial density gradient, and (4) can be stabilized by quasilinear mechanisms in which the initial density is modified by a finite amplitude wave spectrum. Applications are made both to naturally occurring small scale structures in the auroral ionosphere and striation formation in artificially produced ionospheric plasma clouds. Author (GRA)

N84-20278# Texas Univ., Austin. Austin Applied Research Lab.
RAY MODELING METHODS FOR RANGE DEPENDENT OCEAN ENVIRONMENTS
T. L. Foreman 1 Dec. 1983 105 p
(Contract N00014-82-C-0049)
(AD-A137202; ARL-TR-83-41) Avail: NTIS HC A06/MF A01 CSCL 12/1

This report describes mathematical, numerical, and software design methods for ray models for range dependent ocean environments. Numerical techniques are described for solving ray path and intensity differential equations and for computing path length and travel time integrals. Modified cubic splines fit the bathymetry and sound speed profiles with the degree of mathematical smoothness required to eliminate false caustics and shadow zones, while avoiding non-physical excursions sometimes observed in standard splines. Several new interpolation procedures yield eigenray path information. Author (GRA)

N84-20279# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON MEAN KULLBACK-LEIBLER'S INFORMATION MAXIMUM LIKELIHOOD PRINCIPLE AND UNCERTAIN NONLINEAR SYSTEMS
T. S. Lee and K. P. Dunn 30 Nov. 1983 37 p
(Contract F19628-80-C-0002)
(AD-A137222; TR-674; ESD-TR-83-109) Avail: NTIS HC A03/MF A01 CSCL 12/1

The relationship between the (generalized) mean Kullback-Leibler's information and the (generalized) maximum likelihood principle is exploited in this report to analyze the state estimation problems of both discrete-time and continuous-time uncertain non-linear systems. Author (GRA)

N84-20280# Missouri Univ., Columbia. Dept. of Statistics.
ESTIMATION OF TWO-PARAMETER LOGISTIC ITEM RESPONSE CURVES
R. K. Tsutakawa Dec. 1983 34 p
(Contract N00014-81-K-0265)
(AD-A137223; RR-83-1; TR-130) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper presents a method for estimating certain characteristics of test items which are designed to measure ability, or knowledge, in a particular area. Under the assumption that ability parameters are sampled from a normal distribution, the EM algorithm is used to derive maximum likelihood estimates of item parameters of the two-parameter logistic item response curves. The observed information matrix is used to approximate the covariances of these estimates. Responses to a questionnaire on general arthritis knowledge are used to illustrate the procedure and simulated data are used to compare the actual versus estimated items parameters. A computational note is included to facilitate the extensive numerical work required to implement the procedure. Author (GRA)

N84-20281# National Research Council of Canada, Ottawa (Ontario).
EQUATIONS OF MOTION FOR RIGID MULTIBODY SYSTEMS
I. H. Mufti Nov. 1983 38 p
(AD-A137234; DME-DM-3; NRC-22797) Avail: NTIS HC A03/MF A01 CSCL 12/1

Several computer-oriented methods for the formulation of the equations of motion for multibody systems with tree structure and also with closed chains are presented in a unified manner. They all stem from the same basic set of equations which are regarded as arising out of the stationary point condition of a quadratic programming (QP) problem. Using QP theory it is shown that the various methods are just different ways of solving the Lagrangian system of equations. GRA

N84-20282# Ohio State Univ., Columbus.
PAIRWISE BALANCED LATIN SQUARES SHOULD ALWAYS BE USED FOR WITHIN-SUBJECTS DESIGNS
Thomas M. Ostrom, Paul D. Isaac, and C. Douglas McCann (York Univ., England) 20 Dec. 1983 51 p
(Contract N00014-81-K-0112; NR Proj. 170-927)
(AD-A137283; SOCIAL-PSYCHOLOGY-BULL-83-2; TR/ONR-10) Avail: NTIS HC A04/MF A01 CSCL 12/1

The use of repeated measures designs in many areas of psychological research has prompted concern for the potential confounds inherent in the interpretation of treatments that have been included as within-subject variables. Of the solutions proposed for this problem, the most commonly adopted strategy is the use of Latin Square counterbalancing orders for treatment presentation.

Traditional Latin Square designs ensure that each of the experimental treatments included as part of the within-subject factor(s) is administered in each serial position of the treatment sequence. The present paper presents a discussion of a novel technique for the generation of a subset of Latin Squares that control for two additional features that are seen to be important in many research situations, i.e., pairwise priority and distance. Such Latin Squares are referred to as pairwise balanced Latin Squares. The relative advantages of using such Latin Squares in repeated measures designs are discussed. Author (GRA)

N84-20283# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision.
ON THE COMPLEXITY OF DISTRIBUTED DECISION PROBLEMS
J. Tsitsiklis and M. Athans Nov. 1983 6 p
(Contract N00014-77-C-0532)
(AD-A137443; LIDS-P-1345) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document studies the computational complexity of finite versions of the simplest and fundamental problems of distributed decision making and it is shown that, apart from a few exceptions, such problems are hard (NP-complete, or worse). Some of the problems studied are the well-known team decision problem, the distributed hypothesis testing problem, as well as the problem of designing a communications protocol that guarantees the attainment of a prespecified goal with as little communications as possible. These results indicate the inherent difficulty of distributed decision making, even for very simple problems, with trivial centralized counterparts and suggest that optimality may be an elusive goal of distributed systems. GRA

N84-20284# Analytical Technology Applications Corp., Mountain View, Calif.
AMBIGUITY SURFACE STATISTICS AND FLUCTUATIONS Final Report
J. R. LaPointe, Jr. 30 Sep. 1983 84 p
(Contract N00014-80-C-0698; RR0-1405)
(AD-A137499; ATAC0-SV8007-2) Avail: NTIS HC A05/MF A01 CSCL 12/1

The use of cross-correlation for detecting and tracking the source of signals received at spatially separated receiving sites has received considerable attention in the research community during recent years. The limited understanding of the statistical nature of ambiguity surfaces is based on the statistics of a single cell in the absence of signal and noise power fluctuations and for equal signal and processing bandwidths (herein called matched containment). The effects of power level fluctuations and signal overcontainment, where the processing bandwidth is larger than the signal bandwidth, must be quantified in order to fully understand the statistical nature of ambiguity surfaces under realistic operational conditions. The effects of signal overcontainment have been quantified in the absence of fluctuations. Signal and noise power level fluctuations and the rate at which power levels fluctuate can adversely affect the signal-to-noise ratios required to attain a desired performance. The study results presented in this report address the effects of signal and noise power fluctuations on detection performance. GRA

N84-20285# California Univ., Los Angeles. Dept. of Mathematics.
HARMONIZABLE FILTERING AND SAMPLING OF TIME SERIES
D. K. Chang 15 Nov. 1983 29 p
(Contract N00014-79-C-0754)
(AD-A137517; AD-E401120; TR-8) Avail: NTIS HC A03/MF A01 CSCL 12/1

For an output series of a harmonizable process, assumed to be the result of a linear filter, it is desired to obtain the input series. Precise conditions under which this is possible are described for polynomial (and integral) filters. An extension of the Kotel'nikov-Shannon formula for sampling harmonizable processes is given. The inversion is illustrated on an acoustic data with a sixth order polynomial filter in detail. GRA

N84-20286# Naval Postgraduate School, Monterey, Calif.
EFFICIENT COMPUTATION OF THE k-TERMINAL RELIABILITY OF DIRECTED ACYCLIC NETWORKS M.S. Thesis
L. Chan Sep. 1983 48 p
(AD-A136900) Avail: NTIS HC A03/MF A01 CSCL 12/1

This thesis describes several topological reduction and decomposition techniques developed to decrease the complexity of computing K-terminal reliability of an acyclic directed network with independent component failures. A program using these techniques has been coded in FORTRAN and tested on complete acyclic graphs and street networks with up to 100 vertices. GRA

N84-20287# California Univ., Berkeley.
GENERAL PATH-INTEGRAL SUCCESSIVE-COLLISION SOLUTION OF THE BOUNDED DYNAMIC MULTI-SWARM PROBLEM
S. Kuhn 23 Sep. 1983 12 p
(Contracts N00014-77-C-0578; DE-AT03-76ET-53064)
(AD-A136961; UCB/ERL-M83/57) Avail: NTIS HC A02/MF A01 CSCL 12/1

The path-integral successive-collision methods is extended and applied to the set of linear Boltzmann equations for a very general initial- and boundary-value multi-swarm problem allowing for volume production, reactive collisions, and various particle-surface interaction processes. The complete formal solution is given, and its convergence is inferred from a simple physical argument. Author (GRA)

N84-20288# California Univ., Berkeley. Lab. for Electronics Research.
TIME-DEPENDENT CHILD-LANGMUIR DIODE SIMULATION
Stephane Rousset 11 Jul. 1983 48 p
(Contracts N00014-77-C-0578; DE-AT03-76ET53064)
(AD-A136964; UCB/ERL-M83/39) Avail: NTIS HC A03/MF A01 CSCL 12/1

A one dimensional numerical code has been written, which allows the time-dependent simulation of the Child-Langmuir diode and the plasma sheath problem. The model assumes a semi-infinite plasma reservoir from which particles can be emitted into a vacuum region where they can be accelerated or decelerated by means of an external potential on the anode, until they are eventually absorbed by the anode or sent back to the reservoir. Physical results are shown for both the time-independent and the time-dependent cases. Numerical methods are presented for the evaluation of relevant physical quantities. The numerical effects are discussed. Author (GRA)

N84-20289# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ADAPTIVE GRID GENERATION FOR NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS M.S. Thesis
Kevin G. Brown Dec. 1983 77 p
(AD-A136985; AFIT/GAE/AA/83D-3) Avail: NTIS HC A05/MF A01 CSCL 12/1

A new approach for the generation of flow-adaptive grids for numerical solution of fluid dynamics problems is presented. However, the method is applicable to the numerical evaluation of any partial differential equation. The dynamic coupling of the grid with the flow solution is accomplished through a grid-optimization technique. The optimization is based on the minimization of the finite difference truncation error in the transformed plane. The method is tested on the one dimensional Burgers' equation which is representative of typical fluid dynamics problems. Burgers' equation is solved with an optimized SOR (Successive Over Relaxation) method using upwind difference for the convective term. Results are presented for various Reynolds numbers and are compared to results from a similar adaptive grid method and to results for a static grid. They show the ability of the method to concentrate grid points high in gradient regions where large truncation errors occur. Author (GRA)

N84-20290# Ecodynamics Research Associates, Inc., Albuquerque, N. Mex.
ADAPTIVE GRID GENERATION USING ELLIPTIC GENERATING EQUATIONS WITH PRECISE COORDINATE CONTROLS Interim Report
Patrick J. Roache 15 Jun. 1983 6 p
(Contract F49620-82-C-0064; AF Proj. 2304)
(AD-A137006; AFOSR-83-1319TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The author's results previously reported have now been verified in a double precision code which removes any confusion due to machine round-off error. The results conclusively show no loss of order of accuracy from highly stretched grids, even with stretching parameters in an exponential-of-exponential stretch large enough to increase the size of the error by 6 orders of magnitude. GRA

N84-20291# California Univ., San Diego, La Jolla. Dept. of Electrical Engineering and Computer Sciences.
OPTICAL ANALOG & HYBRID COMPUTER SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS Final Report, 1 Jan. - 15 Dec. 1982
Sing H. Lee 2 Oct. 1983 36 p
(Contract F49620-83-K-0022; AF Proj. 2305)
(AD-A137028; AFOSR-83-1296TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

The hybrid optical/electronic processing research at UCSD involves several approaches: (1) Applying digital statistical pattern recognition theory to optical system via the use of computer generated holograms for optical statistical pattern recognition; (2) Incorporating image amplifier into an optical feedback system for solving partial differential equations and performing matrix inversion; (3) Producing nonlinear optical devices using silicon and PLZT for nonlinear image processing; (4) Demonstrating the feasibility of hybrid computing using integrated optical and integrated electronic circuits. GRA

N84-20292# Lowell Univ., Mass. Research Foundation.
FURTHER DEVELOPMENT OF A COMPUTER ALGORITHM FOR THE AUTOMATIC DETERMINATION OF SPACE VEHICLE POTENTIAL IN REAL TIME Final Report, 1 Aug. 1982 - 30 Sep. 1983
S. L. Spiegel Dec. 1983 33 p
(Grant AF-AFOSR-0147-82; AF Proj. 2311)
(AD-A137041; AFOSR-83-1323TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The performance of two related computer algorithms for the purpose of critical potential detection has been analyzed. These algorithms employ positive ion spectra from onboard electrostatic analyzers to determine whether a critical potential has been reached or exceeded. The day to day performances have been examined and individual ion count spectra have been checked in cases of algorithm failure to see what algorithm modifications might lead to improved performance. Additionally, it has been considered whether reliable charge detection could be obtained using a rapid response Electrostatic Analyzer with many fewer energy channels that the 64 channel SC9 experiment of the P78-2 spacecraft. This has led to development of a goodness-of-fit test based on an onboard model of the distribution function profile in the absence of charging. Preliminary tests of this algorithm suggest that it may be useful as a rapid response detection algorithm on its own or as a preliminary test to screen for suspected cases of charging to be further analyzed by one of the other algorithms.
Author (GRA)

N84-20293# Guelph Univ. (Ontario).
CORRELATION STRUCTURE IN ITERATED FARLIE-GUMBEL-MORGENSTERN DISTRIBUTIONS
J. S. Huang and S. Kotz (Maryland Univ., College Park) Jan. 1984 15 p
(Contract N00014-81-K-0301)
(AD-A137055; UMD-DMSS-84/1) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this note the authors determine the natural parameter space of the iterated FGM distribution, and thereby show that the maximum correlation is higher than what was previously known. They also show that one single iteration can result in tripling the covariance for certain marginals and that there exist no marginals for which the single iteration will bring about higher negative correlation. Author (GRA)

N84-20294# Washington Univ., St. Louis, Mo. Dept. of Systems Science and Mathematics.
DEVELOPMENT AND APPLICATION OF THE p-VERSION OF THE FINITE ELEMENT METHOD Interim Report, 30 Sep. 1982 - 29 Aug. 1983
I. N. Katz 29 Aug. 1983 9 p
(Grant AF-AFOSR-0315-82; AF Proj. 2304)
(AD-A137059; AFOSR-84-0006TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Two approaches to finite element analysis are now widely recognized in the engineering and mathematical communities. In both approaches the domain omega is divided into simple convex subdomains (usually triangles or rectangles in two dimensions, and tetrahedera or bricks in three dimensions) and over each sub-domain the unknown (displacement field) is approximated by a (local) basis function (usually a polynomial of degree p). Basis functions are required to join continuously at boundaries of the subdomains in the case of planar or 3 dimensional elasticity, or smoothly in the case of plate bending. The difference between the two approaches lies in the manner in which convergence is achieved. The p-version of the finite element method is a new, important, computationally efficient approach to finite element analysis. It is more robust than the conventional h-version and its rate of convergence, for domains with corners and for other singularity problems, is twice that of the h-version. GRA

N84-20295# Calspan Advanced Technology Center, Buffalo, N.Y.
COMPUTER PROGRAM FOR EVALUATING THE IVES TRANSFORMATION IN TURBOMACHINERY CASCADES, REVISION
William J. Rae Jul. 1983 84 p Supersedes AFOSR-81-0154TR
(Contract F49620-83-C-0096; AF Proj. 2307)
(AD-A137064; CALSPAN-7177-A-1; AFOSR-83-1284TR; AFOSR-81-0154TR) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report contains the description of a computer program for evaluating the Ives transformation, which maps a cascade of turbine or compressor blades conformally into a rectangle.
Author (GRA)

N84-20296# Maryland Univ., College Park. Dept. of Mathematics.
[HIGHER ORDER CROSSINGS] Interim Report, 1 Jun. 1982 - 31 Mar. 1983
B. Kedem and E. Slud Jul. 1983 9 p
(Grant AF-AFOSR-0178-82; AF Proj. 2304)
(AD-A137086; AFOSR-83-1289TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This research focused on higher order crossings of time series and their application in spectral analysis, and on the various point processes obtained from stationary processes and their relations to reliability models. The higher order crossings theorem was extended to two dimensions, and the one dimensional version was used to determine the connection between axis crossings and the frequency content of a stationary process. Considerable progress was made in calculating the asymptotic variance-covariance matrix for the vector of higher-order crossing counts, and time series analysis of highly nonlinear and chaotic stationary processes was carried out. The report summarizes progress in these areas. Author (GRA)

N84-20297# Aeronautical Research Associates of Princeton, Inc., N. J.
TOWARD A NEW KINETIC THEORY FOR RESONANT TRIADS
H. Segur Oct. 1983 32 p
(Contracts DAAG29-81-C-0009; N00014-80-C-0048)
(AD-A137096) Avail: NTIS HC A03/MF A01 CSCL 12/1

Resonantly coupled triads of nearly linear wave modes are

the dominant nonlinear interactions in many physical situations. This documents a new kinetic model of resonantly interacting wave packets. This model applies when the wave packets are dilute in the sense that they participate in triads only occasionally. It differs from previous statistical models in that no random phase approximation is ever made. Phase variations during interactions are computed explicitly, and they are not random. The derivation of the new model is analogous to that of Boltzmann's model of a dilute gas of molecules. However, the appropriate Stosszahlansatz for the wave packets is not analogous to Boltzmann's, so the final kinetic model differs significantly from Boltzmann's equation. Author (GRA)

N84-20298# New Mexico Univ., Albuquerque. Bureau of Engineering Research.
MATHEMATICAL MODELS FOR DAMAGEABLE STRUCTURES Interim Report
M. L. Wang, T. L. Paez, and F. Ju Mar. 1983 91 p
(Grant AF-81-0086; AF Proj. 2307)
(AD-A136574; CE-64(83)AFOSR-993-1; AFOSR-83-1256TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

The reliability of a structural system at a particular time depends on the damage level in the system. When the damage level exceeds a critical value, then failure occurs. Therefore, it is important to track the damage in a structure. In the present investigation some basic models are proposed for the study of damageable structure response. The models are: a higher order linear differential equation with constant coefficients, and a second order linear differential equation with time varying coefficients. Using a digital computer a blast is simulated, and the response of an inelastic structure is computed. Noise signals are added to these and the results are used to simulate measured input and response. Next, using the simulated input and response, the parameters of the linear models are identified and the linear structure responses are computed. Measures of these responses, including peak displacement and energy dissipated are compared to the simulated response. It is shown that the models accurately simulate inelastic structure response. Moreover, the results of some experiments are included. The experiments show that the energy dissipated in a material specimen is related to the damage level. Author (GRA)

N84-20299# Sandia Labs., Albuquerque, N. Mex.
FACTORIZATION USING THE QUADRATIC SIEVE ALGORITHM
J. A. Davis and D. B. Holdridge 1983 11 p refs Presented at CRYPTO 1983 Conf., Santa Barbara, Calif., 21 Aug. 1983
(Contract DE-AC04-76DP-00789)
(DE84-004996; CONF-830831-3) Avail: NTIS HC A02/MF A01

Since the cryptosecurity of the RSA two key cryptoalgorithm is no greater than the difficulty of factoring the modulus (product of two secret primes), a code that implements the Quadratic Sieve factorization algorithm on the CRAY I computer was developed at the Sandia National Laboratories to determine as sharply as possible the current state-of-the-art in factoring. Because all viable attacks on RSA thus far proposed are equivalent to factorization of the modulus, sharper bounds on the computational difficulty of factoring permit improved estimates for the size of RSA parameters needed for given levels of cryptosecurity. Analysis of the Quadratic Sieve indicates that it is faster than any previously published general purpose algorithm for factoring large integers. The high speed of the CRAY I coupled with the capability of the CRAY to pipeline certain vectorized operations make this algorithm (and code) the front runner in current factoring techniques. DOE

N84-20300# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
FUNCTIONING OF MATHEMATICS IN INSTITUTES FOR APPLIED SCIENTIFIC RESEARCH
W. Loeve 10 Nov. 1982 18 p In DUTCH; ENGLISH summary Presented at Introductie en Orientatie, Amsterdam
(NLR-MP-82056-U) Avail: NTIS HC A02/MF A01

Contributions from mathematicians to applied scientific research work are illustrated. Organizational aspects are also discussed. Author (ESA)

N84-20301# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
EXACT IMAGE THEORY FOR THE SOMMERFELD HALF-SPACE PROBLEM WITH A VERTICAL MAGNETIC DIPOLE
Ismo V. Lindell and Esko Alanen 1983 21 p refs
(Rept-S-142; ISBN-951-752-833-7; ISSN-0355-5712) Avail: NTIS HC A02/MF A01

Applying the Laplace transform, the exact distributed image current function is obtained for the Sommerfeld half-space problem with vertical magnetic current source. The resulting field integral is well behaved when the image current is situated in complex space. The theory is valid for any distance, source height frequency and half-space parameters. It is demonstrated that the theory reduces to the dipole image at complex depth for large dielectric parameters of the half space. The reflection-coefficient method is obtained as a far field approximation. Calculation of fields through exact image integration is seen to reduce computer time compared to the original Sommerfeld integration. The multivalued Green's function arising from a dipole source in complex space is also studied. Author (ESA)

N84-20302# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
LINEARIZATION BASED ON LEAST SQUARES APPROXIMATION WITH APPLICATION TO FINITE DIMENSIONAL SYSTEM EQUATIONS
J. G. denHollander Jan. 1983 46 p refs
(VTH-LR-364) Avail: NTIS HC A03/MF A01

The linearization problem is generalized in the sense of approximating nonlinear equations by linear equations within a particular operation region. Least squares linearization methods based on this principle are defined and compared to classical linearization based on truncated Taylor expansion. An analytical evaluation method of least squares linearizations and a numerical method are presented. Applications of linearizations to a simple nonlinear equation demonstrate the possibilities of the method. Application to finite dimensional system equations is described. A modified Newton method based on rudimentary least squares linearization for solving sets of nonlinear equations is discussed. Author (ESA)

N84-20303# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
AN IMPROVED VERSION OF THE CHAMFER MATCHING ALGORITHM
Gunilla Borgefors Nov. 1983 36 p refs
(FOA-C-30344-E1; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

An algorithm used to match edges in two different images for presentation of multisensor data, navigation, target detection, and precision rectification is described. Translation and rotation of the edges are possible. Results show that one of the versions is faster, allows a worse initial guess of the position than the standard one, and is not more difficult to implement. The method is relatively insensitive to noise, and gives acceptable final matching positions. Author (ESA)

N84-19949 Bayerische Akademie der Wissenschaften, Munich (West Germany).
MATHEMATICAL THEORIES, NUMERICAL INVESTIGATIONS
Karl Heinz Ilk *In its* Natl. Rept. of Federal Republic of Germany on Geodetic Acticities, 1979 - 1983 1983 p 142-189 refs In ENGLISH and GERMAN (For primary document see N84-19942 10-42)
Avail: Issuing Activity

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-20304*# Arkansas Univ., Fayetteville. Dept. of Mathematical Sciences.
STATISTICAL MODELING OF SPACE SHUTTLE ENVIRONMENTAL DATA Final Report, 24 Jul. 1981 - 23 Oct. 1983
J. D. Tubbs and D. W. Brewer 23 Oct. 1983 148 p refs
(Contract NAS8-34502)
(NASA-CR-170940; NAS 1.26:170940) Avail: NTIS HC A07/MF A01 CSCL 12A

Statistical models which use a class of bivariate gamma distribution are examined. Topics discussed include: (1) the ratio of positively correlated gamma varieties; (2) a method to determine if unequal shape parameters are necessary in bivariate gamma distribution; (3) differential equations for modal location of a family of bivariate gamma distribution; and (4) analysis of some wind gust data using the analytical results developed for modeling application. For individual titles, see N84-20305 through N84-20308.

N84-20305*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A NOTE ON THE RATIO OF POSITIVELY CORRELATED GAMMA VARIATES Final Report
J. D. Tubbs (Arkansas Univ., Fayetteville) and O. E. Smith *In* Arkansas Univ. Statist. Modeling of Space Shuttle Environ. Data 23 Oct. 1983 p 1-12 refs (For primary document see N84-20304 10-65)
Avail: NTIS HC A07/MF A01 CSCL 12A

The density function and corresponding moments for the ratio of correlated gamma distributed variates were derived. A class of bivariate gamma distributions was also considered, and additional distributional results which use this class of functions were also derived. Similar results, by using a different class of bivariate gamma distributions, are presented. E.A.K.

N84-20306*# Arkansas Univ., Fayetteville.
A METHOD FOR DETERMINING IF UNEQUAL SHAPE PARAMETERS ARE NECESSARY IN A BIVARIATE GAMMA DISTRIBUTION Final Report
J. D. Tubbs *In its* Statist. Modeling of Space Shuttle Environ. Data 23 Oct. 1983 13-34 refs (For primary document see N84-20304 10-65)
Avail: NTIS HC A07/MF A01 CSCL 12A

A procedure to aid in the deciding between four and five parameters in a Jensen's type bivariate gamma distribution is presented. It is based upon the CDF of the ratio of correlated gamma distributed variates. The criteria are posed in a test of hypothesis setting and results are presented. E.A.K.

N84-20307*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A DIFFERENTIAL EQUATIONS APPROACH TO THE MODAL LOCATION FOR A FAMILY OF BIVARIATE GAMMA DISTRIBUTIONS Final Report
D. W. Brewer (Arkansas Univ., Fayetteville), J. D. Tubbs (Arkansas Univ., Fayetteville), and O. E. Smith *In* Arkansas Univ. Statist. Modeling of Space Shuttle Environ. Data 23 Oct. 1983 p 35-61 refs (For primary document see N84-20304 10-65)
Avail: NTIS HC A07/MF A01 CSCL 12A

Analytical and numerical computational methods to determine the location of the mode as a function of the parameters of a class of the bivariate gamma distribution are presented. E.A.K.

N84-20308*# Arkansas Univ., Fayetteville.
ANALYSIS OF WIND GUST DATA Final Report
J. D. Tubbs *In its* Statist. Modeling of Space Shuttle Environ. Data 23 Oct. 1983 p 62-145 refs (For primary document see N84-20304 10-65)
Avail: NTIS HC A07/MF A01 CSCL 12A

Wind gust data were analyzed by statistical and mathematical procedures, developed for the bivariate gamma distribution. The results of the analysis are summarized. E.A.K.

N84-20309# Maryland Univ., College Park. Dept. of Mathematics.
NORM ESTIMATES FOR A MAXIMAL RIGHT INVERSE OF THE DIVERGENCE OPERATOR IN SPACES OF PIECEWISE POLYNOMIALS Final Technical Note
L. R. Scott and M. Vogelius (Maryland Univ., College Park) Nov. 1983 52 p
(Contract N00014-77-C-0623; Grant NSF MCS-83-03242)
(AD-A136889; AD-E750159; BN-1013) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper studies the divergence operator acting on continuous piecewise polynomials of degree $p + 1$, $p > 3$, on triangulations of a plane polygonal domain omega. The authors give a characterization of the range of the divergence operator and the full details of a combinatorial verification of this. GRA

N84-20310# Stanford Univ., Calif. Dept. of Civil Engineering and Engineering Mechanics.
INSPECTIONS WITH UNKNOWN DETECTION PROBABILITIES
Cyrus Derman, Gerald J. Lieberman (Stanford Univ.), and Sheldon M. Ross (California Univ., Berkeley) Nov. 1983 24 p
(Contract N00014-75-C-0561; Grants NR-047-200; AF-AFOSR-0122-81)
(AD-A136890; AD-E750159; SU-TR-211) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document assumes that in an acceptance sampling situation the lot is subject to 100% inspection. The probability that a defective unit is detected is different for each inspector and is unknown. It is of interest to estimate N, the number of defective units in the lot (presumably, a decision to reject or accept the lot would be based on the estimate of N). Or, suppose satellites are used for surveillance over a given part of the Earth with the detection of certain types of installations being the mission of a given satellite. However, for various reasons, it can be assumed the detection of any existing installation is uncertain with an unknown probability of detection that varies among satellites. The problem is to estimate the total number of installtions based on the number observed. A third situation involves the reading of a manuscript by many proofreaders. Based on the results, it may be of interest to estimate the total number of typographical errors. GRA

N84-20311# California Univ., Berkeley. Electronics Research Lab.
THEORY OF ASYMMETRIC DOUBLE LAYERS
K. Y. Kim 22 Jul. 1983 8 p Sponsored by DOE
(Contract N00014-77-C-0578)
(AD-A136960; UCB/ERL-M83/45) Avail: NTIS HC A02/MF A01 CSCL 12/1

The author presents analytic solutions for asymmetric double layers which satisfy the time stationary Vlasov-Poisson system and which require the double-valuedness of Sagdeev potential as a function of physical potential: it is pointed out that any distribution function having an analytic density representation as a polynomial power series of potential can never satisfy the asymmetric double layer boundary conditions. Considering K-dV like equation, it is found that there is some relationship between the speed of asymmetric double layer and the degree of asymmetry.
Author (GRA)

N84-20312# Arizona State Univ., Tempe. Dept. of Computer Science.
APPROACHES TO AUTOMATIC STRATEGY ANALYSIS AND SYNTHESIS Final Report, 1 Sep. 1982 - 31 Aug. 1983 on Phase 2
N. V. Findler 1 Sep. 1983 10 p
(Grant AF-AFOSR-0340-82; AF Proj. 2304)
(AD-A137067; AFOSR-83-1346TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The efforts of the Group for Computer Studies of Strategies centered on five long-term projects: (1) The Generalized Production Rules System (GPRS) is a program which can support decision-making for a variety of expert systems in need of estimates of hidden variables. Hidden variables are such that their values can be identified only at certain times, either intermittently or periodically. In contrast, open variables are readily measureable at any time. The estimation is based on stochastic, causal relations between hidden and open variables. (2) The Quasi-Optimizer System (QO) is a program which observes and measures adversaries' behavior in confrontations, infers their strategies, and constructs a descriptive theory, i.e., a model, of each. It then identifies the components of the strategies, evaluates their effectiveness and combines the most satisfactory ones into a normative theory which is an optimum strategy in the statistical sense. (3) The advice Taker/Inquirer (AT/I) is a program which can be taught strategies by a human Advisor. The Advisor provides principles and high-level examples of actions in different situations. The system applies the strategy to test, verify and optimize the strategy. (4) The Interactive Environment for Planning and Decision Making uses two graphics screens, one displaying features of the current world, the other those of an extrapolated world with the estimated consequences of tentative decisions. (5) The Integrated System of Strategy Analysis and Synthesis for Air Traffic Control will be useful in teaching and evaluating Air Traffic Control Trainees. Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N84-20313# Naval Postgraduate School, Monterey, Calif.
DESCRIPTION AND ANALYSIS OF PACAM 5 (PILOTED AIR COMBAT ANALYSIS MODEL) AS A TACTICAL DECISION AID WITH A USER'S GUIDE FOR OPERATION AT NPS M.S. Thesis
D. M. Kelly Sep. 1983 78 p
(AD-A136793) Avail: NTIS HC A05/MF A01 CSCL 15/7

The increasing cost of a thorough flight test of new fighter air-to-air tactics and equipment has made the use of simulation computer models to assist in this process desirable. This study presents an analysis and description of PACAM 5 (Piloted Air Combat Analysis Model). PACAM 5 is a computer model developed to assist in the evaluation of aircraft, armament, and tactics by simulating the performance of aircraft and weapons in combat. The PACAM damage models for the computation of aircraft probability of kill are analyzed and suggestions for improvement are made. An interactive User's Manual for operation of the model on the IBM-3033 computer at the Naval Postgraduate School is presented. Author (GRA)

N84-20314# Naval Postgraduate School, Monterey, Calif.
NEAR-OPTIMAL FINITE SOLUTIONS TO THE 3 AND 4 STEP DISCRETE EVASION GAMES M.S. Thesis
Scott W. Goodson Sep. 1983 50 p
(AD-A136811; AD-E301284) Avail: NTIS HC A03/MF A01 CSCL 12/1

A review of discrete pursuer-evader games and known solutions is presented. A method is given for obtaining a finite memory, near-optimal evader strategy for the three-step game, which greatly reduces data storage requirements from previous near-optimal strategies. Additionally near-optimal evader strategies for the four-step game are discussed. Author (GRA)

N84-20315# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
A SINGLE SERVER QUEUE WITH MIXED TYPES OF INTERRUPTIONS: APPLICATION TO THE MODELING OF CHECKPOINTING AND RECOVERY IN A TRANSACTIONAL SYSTEM
V. F. Nicola Jul. 1983 24 p refs
(EUT-83-E-138; ISBN-90-6144-138-2; ISSN-0167-9708) Avail: NTIS HC A02/MF A01

The average number of customers in an M/G/1 queue with mixed types of Poisson interruptions is derived. The relation to the Pollaczek-Kintchine formula is noted. The analysis is based on the definiton of the effective service time and the completion time associated with a customer's service. The results are applied to the modeling of checkpointing and recovery in a transactional system. Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-20316# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
RECURSIVE LAGRANGIAN DYNAMICS OF FLEXIBLE MANIPULATOR ARMS VIA TRANSFORMATION MATRICES Interim Technical Report
Wayne J. Book Dec. 1983 28 p
(AD-A137345; CMU-RI-TR-83-23) Avail: NTIS HC A03/MF A01 CSCL 12/1

Improving the performance of most engineering systems requires the ability to model the system's behavior with improved accuracy. The evolution of the mechanical arm from teleoperator and crane to present day industrial and space robots and large space manipulators is no exception. Initial simple kinematic and dynamic models are no longer adequate to improve performance in the most critical applications. Both the mechanical system and control system require improved models for design simulation. Proposed new control algorithms require dynamic models for control calculation. Planning and programming activities as well as man-in-the-loop simulation also require accurate models of the arms. Accuracy is usually acquired at some cost. The application of mechanical arms to economically sensitive endeavors in industry and space also gives incentive to improve the efficiency of the formulation and simulation of dynamic models. Control algorithms and man-in-the-loop simulation require real time calculation of dynamic behavior. Formulation of the dynamics in an easy to understand conceptual approach is also important if maximum use of the results is to be obtained. The nonlinear equations of motion for flexible manipulator arms consisting of rotary joints connecting two flexible links are developed. Kinematics of both the rotary joint motion and the link deformation are described by 4x4 transformation matrices. The link deflection is assumed small so that the link transformation can be composed of summations of assumed link shapes. The resulting equations are presented as scalar and 4x4 matrix operations ready for programming. Author (GRA)

N84-20317# Wisconsin Univ., Madison. Center for Mathematics Research.
STABLE CONVEX SETS OF MATRICES
Shmuel Friedland Nov. 1983 16 p
(Contract DAAG29-80-C-0041)
(AD-A136659; MRC-TSR-2600) Avail: NTIS HC A02/MF A01 CSCL 12/1

A subset alpha of nxn complex valued matrices is stable if all powers of all matrices from the set alpha are uniformly bounded. We show that if alpha is a bounded convex circular set which spans a stable linear subspace of matrices, then alpha is stable if the spectral radius of any a approaching alpha is bounded by 1. Author (GRA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-20318# California Univ., Livermore. Lawrence Livermore Lab.

COMPUTATIONAL PHYSICS PROGRAM AT NATIONAL MPE COMPUTER CENTER
Arthur A. Mirin Nov. 1983 39 p refs Revised
(Contract W-7405-eng-48)
(DE84-004602; UCID-17530-Rev-3) Avail: NTIS HC A03/MF A01

The computational physics group is involved in several areas of fusion research. One main area is the application of multidimensional Fokker-Planck, transport and combined Fokker-Planck/transport codes to both toroidal and mirror devices. Another major area is the investigation of linear and nonlinear resistive magnetohydrodynamics in two and three dimensions, with applications to all types of fusion devices. The MHD work is often coupled with the task of numerically generating equilibria which model experimental devices. In addition to these computational physics studies, investigations of more efficient numerical algorithms are being carried out. DOE

N84-20319# California Univ., Livermore. Lawrence Livermore Lab.
APPLICATION OF He-II TECHNOLOGY TO THE PRODUCTION OF ULTRAHIGH-FIELD SUPERCONDUCTING MAGNETS
Ronald W. Hoard Nov. 1983 8 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-48)
(DE84-004853; UCRL-89979; CONF-831203-37) Avail: NTIS HC A02/MF A01

Data and operating experience acquired during the last three years on the heat transfer properties of pressurized superfluid He II indicate that the fluid is successfully used as a coil coolant for high-field superconducting magnets. Indeed, the fluid seems to offer triple benefits over that of ordinary normal life: (1) coil conductors can be driven to wetted perimeter heat fluxes exceeding 1/W cm(+2); (2) the reduced low-temperature operation (from 4.2) at 1.8 K enhances the critical current densities (J/sub c/) of both Nb3Sn and ternary additions to the compound by 140 to 200%; (3) the upper critical field (H/sub c2/) also increases, allowing viable solenoid magnet designs approaching 20-T peak fields. The significant properties of He II relevant to magnet design are reviewed, current superconducting coils and systems that utilize the fluid are described and the possible application of the present data base to production of future ultrahigh-field superconducting coils yielding 20-T fields are discussed. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N84-20320*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW FREQUENCY NOISE IN A QUIET, CLEAN, GENERAL AVIATION TURBOFAN ENGINE
Ronald G. Huff, Donald E. Groesbeck, and Jack H. Goodykoontz Jan. 1984 55 p refs
(NASA-TM-83520; E-1879; NAS 1.15:83520) Avail: NTIS HC A04/MF A01 CSCL 20A

A quiet, clean, general aviation, turbofan engine was instrumented to measure the fluctuating pressures in the combustor, turbine exit duct, engine nozzle and the far field. Both a separate flow nozzle and an internal mixer nozzle were tested. The fluctuating pressure data are presented in overall pressure and power levels and in spectral plots. The combustor data are compared to recent theory and found to be in excellent agreement. The results indicate that microphone correction procedures for elevated mean pressures are questionable. Ordinary coherence function analysis suggests the presence of an additional low frequency noise source downstream of the turbine that is due to the turbine itself. Low frequency narrowband data and coherence function analysis are presented. Author

N84-20321# Science Applications, Inc., McLean, Va.
TECHNICAL SPECIFICATIONS FOR SPREAD FUNCTION MODEL
May 1983 48 p
(Contract N00014-83-C-0179)
(AD-A137292; SAI-84-982-WA) Avail: NTIS HC A03/MF A01 CSCL 20/1

In order to design and accurately estimate the performance of a candidate passive sonar system the systems engineer needs considerably more information than the standard terms in the passive sonar equation. The sonar equation typically deals with the mean values of the total signal and noise fields. All departures from these means are considered only in the time domain as fluctuations in signal excess which lead to the probabilistic description of the detection process in terms of ROC curves, etc. As a first refinement of this approach, still in the mean value sense however, a higher resolution description of these fields is sought. In order to estimate array signal gain, processor gain, and detection and localization performance additional information beyond these means is required on the spreads of these values. This paper addresses the technical specifications for a set of models to support these requirements. For this treatment only second moments (distributions for angles, decorrelation times, frequency spreads) will be considered. While higher-order moments are desirable, their general treatment is beyond the scope of the present effort. In some special cases, such as the distribution of intensity (a collapsed fourth-order moment), estimates may be possible and are considered. GRA

N84-20322# Naval Postgraduate School, Monterey, Calif.
ABSOLUTE ELECTROACOUSTIC MEASUREMENT OF TEMPERATURE OSCILLATIONS IN SUPERFLUID HELIUM BY THE RECIPROCITY METHOD M.S. Thesis
B. R. Ogg and J. Valdivia, Jr. Dec. 1983 161 p
(AD-A136951; AD-E001638) Avail: NTIS HC A08/MF A01 CSCL 20/1

An experiment will be described which has verified for the first time an extension of the reciprocity calibration technique to reversible thermal transducers in superfluid helium. A plane-wave resonator of circular cross-section was capped at both ends by reversible teflon slit-electret diaphragms to generate or detect thermal waves. The resonator also incorporated a heater and a d.c.- biased carbon resistance thermometer to set independent upper and lower limits on the thermal excursions within the resonator. The temperature excursions measured by the reciprocity method fell between the upper and lower limits, which, for lower modes, were separated by only a few percent. For higher modes, the lower limit departed from the upper limit due to the thermal inertia of the resistance thermometer, but the reciprocity result remained only a few percent below the upper bound set by the thermophone over nearly a decade in frequency. The slit-electret transducers had sensitivities in excess of 100 V/K, and temperature oscillations as small as 10 to the 10th power K/square root of Hz were detected. GRA

N84-20323# Stanford Univ., Calif.
ROUGH SURFACE SCATTERING VIA THE SMOOTHING METHOD
John G. Watson and Joseph B. Keller Nov. 1983 7 p
(Grant AF-AFOSR-0134-79; AF Proj. 2304)
(AD-A137025; AFOSR-83-1316TR) Avail: NTIS HC A02/MF A01 CSCL 20/1

The smoothing method is used to find the first two moments, i.e., the mean and the two-point two-time correlation function, of the field scattered by a rough surface. The results are expressed in terms of a reflection coefficient and a differential scattering coefficient. They are compared with those found by several other methods. Author (GRA)

N84-20324# California Univ., Livermore. Lawrence Livermore Lab.
HIGH FREQUENCY ACOUSTIC INSTABILITIES IN HEATED FLUIDS
R. C. Y. Chin, J. C. Garrison, C. D. Levermore, and J. Wong 19 Dec. 1983 37 p refs
(Contract W-7405-eng-48)
(DE84-005114; UCID-19960) Avail: NTIS HC A03/MF A01

The hydrodynamic equations describing the evolution of a fluid which is homogeneously heated, either by irradiation or by internal reactions, have a solution with constant density, zero velocity and time-dependent temperature. Conditions governing the stability of this solution with respect to high-frequency acoustic perturbations are obtained. The frequency omega of the perturbation satisfies omega/sub w/ > 1, where t/sub w/ is a characteristic heating time. Stability estimates are made for the early heating stage where cooling mechanisms are neglected, and for the steady-state phase where heating and cooling mechanisms exactly balance. The estimates are made in a two ways: (1) a linearized calculation, employing two time perturbation theory, which includes the dissipative effect of heat conductivity; and (2) a calculation which neglects conductivity but includes the leading nonlinear wave interactions. The true instability growth rate is bounded by the smaller of these estimates. Author

N84-19846# Brueel and Kjaer Instruments, Inc., Gaithersburg, Md.
INDUSTRIAL NOISE CONTROL: THE PAST THREE YEARS
R. J. Peppin *In* the Shock and Vibration Digest, Vol. 15, No. 7 Jul. 1983 p 3-15 refs (For primary document see N84-19845 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/1

N84-19864# Ocean Data Systems, Inc., Rockville, Md.
UNDERWATER ACOUSTIC MODELING TECHNIQUES
P. C. Etter *In* the Shock and Vibration Digest, Vol. 16, No. 1 Jan. 1984 p 17-23 refs (For primary document see N84-19862 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/1

N84-19883*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACOUSTIC RESPONSES OF COUPLED FLUID-STRUCTURE SYSTEM BY ACOUSTIC-STRUCTURAL ANALOGY
Y. S. Shin (Naval Postgraduate School) and M. K. Chargin *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 11-21 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/1

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-20325*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ATLAS OF HIGH RESOLUTION INFRARED SPECTRA OF CARBON DIOXIDE
C. P. Rinsland, D. C. Benner (College of William and Mary, Williamsburg, Va.), V. Malathy Devi (College of William and Mary, Williamsburg, Va.), P. S. Ferry (College of William and Mary, Williamsburg, Va.), C. H. Sutton (Systems and Applied Sciences Corp., Hampton, Va.), and D. J. Richardson (Systems and Applied Sciences Corp., Hampton, Va.) Feb. 1984 468 p refs
(NASA-TM-85764; NAS 1.15:85764) Avail: NTIS HC A20/MF A01 CSCL 20H

An atlas of long-path room-temperature absorption spectra of carbon dioxide is presented for the spectral intervals 1830-2100 cm, 2395-2680 cm, and 3140-3235 cm. The spectral data were recorded at high signal to noise with the 0.01 cm resolution Fourier transform interferometer. The spectra were obtained with pressures between 1 and 10 Torr of CO2 and with total paths between 24 and 384 meters. A compilation of the measured line positions and the assignments derived from the analysis are presented. Of the 3336 lines in the atlas, 94 percent were identified as CO2 lines or as residual lines H2O and CO. Calculated positions are presented for the carbon dioxide lines; a total of 52 bands of C-12O2-16, C-13O2-16, C-12O-16O-18, C-12O-16O-17, and C-13O-16O18 were identified. The weakest carbon dioxide lines marked in the atlas have intensities of approximately 0.5 x 10 to the negative 26th power cm/molecule at room temperature. S.L.

N84-20326# Air Force Academy, Colo.
THEORETICAL CHEMICAL CALCULATIONS ON MOLECULES OF AIR FORCE INTEREST Final Report
L. Davis, A. Turner, R. M. Guidry, and T. Menard Nov. 1983 38 p
(AF Proj. 2303)
(AD-A137203; FJSRL-TR-83-0014) Avail: NTIS HC A03/MF A01 CSCL 07/4

Semiempirical molecular orbital calculations are reported in areas of basic chemical Air Force research: explosives, propellants, electrochemistry, and the oxygen-iodine laser system. This report is a final report on Work Unit 2303-F4-03, Molecular Orbital Calculations of Energetic Materials. These molecular orbital calculations have given useful insights in each of these areas. In particular, substantial progress on understanding TNT thermochemical decomposition has been made. GRA

N84-20327# Naval Research Lab., Washington, D. C. Plasma Radiation Branch.
ATOMIC STRUCTURE IN STRONGLY COUPLED NEON PLASMAS
R. Cauble (Berkeley Research Associates, Springfield, Va.), M. Blaha (Maryland Univ., Coll. Park), and J. Davis 13 Jan. 1984 25 p
(RR0-1109)
(AD-A137341; NRL-MR-5252) Avail: NTIS HC A02/MF A01 CSCL 12/1

A self-consistent, completely quantum mechanical formalism has been developed that characterizes the fundamental atomic properties of ions in dense plasma. This theory is applied to neon plasmas under strongly-coupled conditions and the results are compared with those obtained from the hypernetted chain approximation employing a semiclassical two-body interaction. The comparisons point out the inappropriateness of Debye-Huckel and ion-sphere approximations for atomic calculations in strongly coupled plasmas and indicate that the self-consistent theory provides a method obtaining meaningful results when the plasma ion coupling parameter is of order five. Author (GRA)

N84-20328# JAYCOR, Alexandria, Va.
THE MODIFIED BETATRON ACCELERATOR EXPERIMENT Final Report, 12 Jan. 1981 - 10 Dec. 1982
F. M. Mako 6 Jan. 1984 205 p
(Contract N00014-81-C-2095)
(AD-A137447; JAYCOR-J206-84-001/6207) Avail: NTIS HC A10/MF A01 CSCL 20/7

The following topics are discussed: a free electron laser driven by a long pulse induction linac; a special focus program advanced accelerator modified betatron design review coil design; and external injection into a high current modified betatron accelerator; an electron drift in a linear magnetic wiggler with an axial guide field; a broadband high power millimeter to centimeter spectrometer; an electron draft in a linear magnetic wiggler with an axial guide field; a numerical simulation of high energy light ion beam flow through a foilless diode; and high current, high voltage accelerators as free-electron laser drivers. GRA

N84-20329# Mission Research Corp., Albuquerque, N. Mex.
MODIFIED BETATRON ACCELERATOR STUDIES Final Report, 1 Sep. 1981 - 31 Oct. 1983

T. P. Hughes, B. B. Godfrey, and M. M. Campbell Dec. 1983 158 p
(Contract N00014-81-C-0647)
(AD-A137508; AMRC-R-524) Avail: NTIS HC A08/MF A01 CSCL 20/7

Results of an extensive study of the modified betatron accelerators are reported. The topics are beam injection, equilibrium and stability. Three dimensional particle simulations of injections were performed. The results show good agreement with theory. Various types of equilibria were studied using two dimensional simulations. Results are compared to the calculations of Finn and Manheimer. Beam stability is investigated using a combination of analytic and numerical techniques. Growth rates of the negative mass, resistive wall, beam breakup, and image displacement instabilities are calculated. A new theory of the negative mass instability, keeping toroidal corrections to Maxwell's equations, is derived. Good agreement between theory and simulations is obtained. The negative mass instability is shown to be the dominant instability. Simulations show that it can disrupt the beam in a time of order one microsecond. Stabilization may require a beam of large minor radius. Work on the other instabilities show that measures can be taken to make their effect negligible.
Author (GRA)

N84-20330# California Inst. of Tech., Pasadena.
ON THE THEORY OF ELECTRON, H-ATOM AND PROTON TRANSFERS
R. A. Marcus 17 Jan. 1984 26 p Presented at the Symp. on the Chem. and Phys. of Electrocatalysis, San Francisco, 8-13 May 1983
(Contract N00014-79-C-0009)
(AD-A137511; AD-E401120; TR-14) Avail: NTIS HC A03/MF A01 CSCL 07/4

The initial part of this article discusses some recent experiments on electron transfer reactions and comments on the related theory, including the frequency of solvent fluctuations. Also described are recent advances with Babamov and Lopez on the dynamics of H(-)atom transfer reactions. We then outline the application of the basic idea to H and H(+) transfers in complex systems and in condensed phases (fast H(-) coordinates, slow remaining coordinates). Similarities and differences between electron transfers and H or H(+) transfers are next described. The relation of the present theory of such transfers to conventional transition state theory is discussed.
Author (GRA)

N84-20331# Harry Diamond Labs., Adelphi, Md.
NONLINEAR DYNAMIC POLARIZATION FORCE ON A RELATIVISTIC TEST PARTICLE IN A NONEQUILIBRIUM BEAM-PLASMA SYSTEM
H. E. Brandt Sep. 1983 29 p
(DA Proj. 1L1-61101-A-91A)
(AD-A136768; HDL-TR-1994) Avail: NTIS HC A03/MF A01 CSCL 20/8

The effective charge of a test particle in a nonequilibrium beam-plasma system is the sum of the actual charge and the dynamic polarization charge surrounding it. The contribution of its polarization charge to the total force on a relativistic test particle, namely the dynamic polarization force, is calculated to fourth order in the total electromagnetic field for a slowly varying, nearly spatially independent background distribution with no external fields. This relation is needed in calculations of collective radiation processes and the conditions for the occurrence of radiative instability in relativistic beam-plasma systems.
Author (GRA)

N84-20332# State Univ. of New York, Stony Brook. Dept. of Chemistry.
STABLE ISOTOPE STUDIES Annual Progress Report, 1 Mar. 1983 - 29 Feb. 1984
Takanobu Ishida 31 Oct. 1983 91 p refs
(Contract DE-AC02-80ER-10612)
(DE84-002436; DOE/ER-10612/9) Avail: NTIS HC A05/MF A01

The vapor pressure isotope effects (VPIE) between C(13)H2F2 and C(12)H2F2 and one between C(12)D2F2 were measured between 150 and 250 K. The C(13)/C(12) effect is inverse, and its magnitudes fall within a narrow difference between the C(13)/C(12) VPIE of methyl fluoride and fluoroform. The (normal) D/H-VPIE, however, shows magnitudes which are significantly higher than the D/H-VPIE's of methyl fluoride and fluoroform. In preparation for VPIE measurements of liquid and solid ammonia, N(14)H3, N(15)H3, and N(14)D3 samples were purified against water, O2, CH4, N2, and CO by using a combination of sodium treatment, distillation, and preparative GC. Impurity levels of the purified specimen are below 5 ppM for all impurities. The N(15) fractionation column system based on the NO/N2O3 exchange, was successfully operated under pressures up to 3 atm. The single stage separation factor (alpha) linearly increases with pressure, from 1.006 at 1 atm to 1.029 at 2.7 atm at 15.50C. The HETP slowly increases with decreasing concentration of +4 nitrogen which catalyzes the exchange reaction.
DOE

N84-20333# California Univ., Berkeley. Lawrence Berkeley Lab.
MOLECULAR ION PHOTOFRAGMENT SPECTROSCOPY Thesis
S. W. Bustamente Nov. 1983 229 p refs
(Contract DE-AC03-76SF-00098)
(DE84-003299; LBL-16633) Avail: NTIS HC A11/MF A01

A new molecular ion photofragment spectrometer is described which features a supersonic molecular beam ion source and a radio frequency octapole ion trap interaction region. This unique combination allows several techniques to be applied to the problem of detecting a photon absorption event of a molecular ion. In particular, it is possible to obtain low resolution survey spectra of exotic molecular ions by using a direct vibrational predissociation process, or by using other more indirect detection methods. The use of the spectrometer is demonstrated by measuring the lifetime of the O(24) (4Pi sub U) metastable state which is found to consist of two main components: the (4)pi/sub 5/2/ and (4)oi/sub -1/2/ spin components having a long lifetime (approx. 129 ms) and the (4)pi/sub 3/2/ and (4)pi/sub 1/2/ spin components having a short lifetime (approx. 6 ms).
DOE

N84-20334# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
DETECTION METHODS FOR ATOMS AND RADICALS IN THE GAS PHASE [NACHWEISMETHODEN VON ATOMEN UND RADIAKALEN IN DER GASPHASE]
W. Hack and H. Gg. Wagner Jan. 1983 74 p refs
(MPIS-1/1983; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,10

Application, specificity, and sensitivity of detection methods for atoms and radicals in the gas phase which are of interest for environmental and flame chemistry are reviewed. Detection methods for the five atoms of group 4 and for 60 radicals containing at least one atom of group 4 are summarized. Detection methods for another 25 atoms and 60 radicals are listed. Kinetic applications of the methods are given.
Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-20335# Oak Ridge National Lab., Tenn.
SPACE REACTOR SHIELDING: AN ASSESSMENT OF THE TECHNOLOGY
D. E. Bartine and W. W. Engle, Jr. 1982 26 p refs Presented at Natl. Res. Council Symp. on Advan. Compact Reactor Systems, Washington, D.C., 15 Nov. 1982
(Contract W-7405-eng-26)
(DE84-003319; CONF-821148-4) Avail: NTIS HC A03/MF A01

Space power reactor systems require shielding to protect payload and reactor shielding components, and also maintenance

and operating personnel. Shield composition, size, and shape are important design considerations, since the shield can dominate the overall weight of the system. Techniques for space reactor shield design analysis and optimization and experimental test facilities are available for design verification. With these tools, a shielding technology in support of current and future space power reactor systems can be developed. Efforts in this direction should begin with a generic shielding program to provide information on materials properties and geometric effects and should be followed by project-specific shielding programs to provide design optimization and prototype shield verification. DOE

74 OPTICS

Includes light phenomena.

N84-20336*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Sciences.
A LABORATORY INVESTIGATION OF THE REFLECTIVE PROPERTIES OF SIMULATED, OPTICALLY THICK CLOUDS Final Report, 15 May 1980 - 30 Sep. 1982
Thomas B. McKee and Stephen K. Cox 30 Sep. 1982 64 p refs
(Grant NAG5-58)
(NASA-CR-175158; NAS 1.26:175158) Avail: NTIS HC A04/MF A01 CSCL 20P

An overview of the progress made toward the specific scientific goals of the Cloud Field Optical Simulater project is given. For individual titles, see N84-20337 through N84-20339.

N84-20337*# Colorado State Univ., Fort Collins.
[DESIGNING AND CONSTRUCTING THE CLOUD FIELD OPTICAL SIMULATOR (CFOS)]
In its A Lab. Invest. of the Reflective Properties of Simulated, Opt. Thick Clouds 30 Sep. 1982 9 p (For primary document see N84-20336 10-74)
Avail: NTIS HC A04/MF A01 CSCL 20F

A Cloud Field Optical Simulator (CFOS) was designed and constructed. A set of photographs are included to illustrate the actual appearance of CFOS. B.G.

N84-20338*# Colorado State Univ., Fort Collins.
THE CLOUD FIELD SIMULATION PROJECT
In its A Lab. Invest. of the Reflective Properties of Simulated, Opt. Thick Clouds 30 Sep. 1982 14 p ref (For primary document see N84-20336 10-74)
Avail: NTIS HC A04/MF A01 CSCL 20F

Progress toward the research goals of CFOS (the Cloud Field Optical Simulator) were noted in the following areas: (1) improvement in the shape of the desired (visible) spectra response of the measurement, (2) selection of two usable materials for cloud simulation, (3) a means of assigning a visible optical depth to the simulated clouds, and (4) confirmation that the apparatus is capable of detecting basic finite cloud characteristics. Author

N84-20339*# Colorado State Univ., Fort Collins.
DESIGN AND VERIFICATION OF A CLOUD FIELD OPTICAL SIMULATOR
J. M. Davis, S. K. Cox, and T. B. McKee *In its* A Lab. Invest. of the Reflective Properties of Simulated, Opt. Thick Clouds 30 Sep. 1982 37 p refs (For primary document see N84-20336 10-74)
Avail: NTIS HC A04/MF A01 CSCL 20F

A concept and an apparatus designed to investigate the reflected and transmitted distributions of light from optically thick clouds is presented. The Cloud Field Optical Simulator (CFOS) is a laboratory device which utilizes an array of incandescent lamps as a source, simulated clouds made from cotton or styrofoam as targets, and an array of silicon photodiodes as detectors. The device allows virtually any scurce-target-detector geometry to be examined. Similitude between real clouds and their CFOS cotton or styrofoam counterparts is established by relying on a linear relationship between optical depth and the ratio of reflected to transmitted light for a semi-infinite layer. Comparisons of principal plane radiances observed by the CFOS with Monte Carlo computations for a water cloud at 0.7 microns show excellent agreement. Author

N84-20340*# National Aeronautics and Space Administration, Washington, D. C.
STATIONARY AND NON-STATIONARY NONLINEAR OPTICAL SPECTROSCOPY ON SURFACE POLARITONS
H. E. Ponath Jan. 1984 21 p refs Transl. into ENGLISH from Ann. Phys. (Leipzig), v. 36, no. 4, 1979 p 253-265 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Friedrich-Schiler Univ., Jena, East Germany
(Contract NASw-3542)
(NASA-TM-77388; NAS 1.15:77388) Avail: NTIS HC A02/MF A01 CSCL 20F

A phenomenological theory is given for non-stationary electromagnetic surface waves propagating along the boundary plane between two homogeneous isotropic media. The description of nonlinear optical effects using shortened wave equations is demonstrated for spontaneous and simulated Raman scattering processes on surface polaritons. Author

N84-20341*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE AXAF TECHNOLOGY PROGRAM: THE OPTICAL FLATS TESTS
A. C. Williams, J. D. Harper, J. C. Reily, M. C. Weisskopf, C. L. Wyman, and M. Zombeck (Smithsonian Astrophysical Observatory) Jan. 1984 97 p refs
(NASA-TM-82570; NAS 1.15:82570) Avail: NTIS HC A05/MF A01 CSCL 20F

The results of a technology program aimed at determining the limits of surface polishing for reflecting X-ray telescopes is presented. This program is part of the major task of developing the Advanced X-ray Astrophysical Facility (AXAF). By studying the optical properties of state-of-the-art polished flat surfaces, conclusions were drawn as to the potential capability of AXAF. Surface microtopography of the flats as well as their figure are studied by X-ray, visual, and mechanical techniques. These techniques and their results are described. The employed polishing techniques are more than adequate for the specifications of the AXAF mirrors. M.A.C.

N84-20342# Polytechnic Inst. of New York, Brooklyn. Dept. of Mechanical and Aerospace Engineering.
TRANSVERSE AND QUANTUM EFFECTS IN LIGHT CONTROL BY LIGHT; (A) PARALLEL BEAMS: PUMP DYNAMICS FOR THREE LEVEL SUPERFLUORESCENCE; AND (B) COUNTERFLOW BEAMS: AN ALGORITHM FOR TRANSVERSE, FULL TRANSIENT EFFECTS IN OPTICAL BI-STABILITY IN A FABRYPEROT CAVITY Final Report, Dec. 1979 - 31 Jul. 1983
F. P. Mattar 1983 480 p
(Contract N00014-80-C-0174)
(AD-A136906; POLY-M/AE-83-4) Avail: NTIS HC A21/MF A01 CSCL 20/6

Computational methodologies were developed to treat rigorously (1) transverse boundary in an inverted (amplifying) media; (2) to treat quantum fluctuations in an initial boundary condition in the light-matter interactions problem; (3) construct a two-laser three-level code to study light control by light effect; (4) construction of a data base that (a) would manage the production of different types of laser calculations: cylindrical, cylindrical with atomic frequency broadening, cartesian geometry; (all of the above with quantum mechanical initiation), (b) allow parametric comparison within the same type of calculations, by establishing a unifying protocol of software storage, of the various refinements of the model could be contrasted among themselves and with experiment; (5) construct an algorithm for counterbeam transient studies for optical bistability and optical oscillator studies. (A) Transverse propagation effects in an inverted medium were studied. Special care had to be taken to treat the boundary reflection conditions. If ill-posed, they can obscure the emergence of any new physical

results. The two transverse effects considered are (1) the spatial averaging associated with the initial atomic inversion density being radially dependent (since the pump which inverts the sample has typically a Gaussian-like profile); and (2) the diffraction coupling (which permits the various parts of the cylindrical cross-section to communicate, interact and emit at the same time). The first effect is important for large Fresnel numbers, whereas the second predominant is for small Fresnel numbers. GRA

N84-20343# Arizona Univ., Tucson.
OPTICAL PROCESSING IN RADON SPACE Annual Report, Jul. 1982 - Jul. 1983
Harrison H. Barrett 1 Oct. 1983 16 p
(Grant AF-AFOSR-0249-82; AF Proj. 2503)
(AD-A137033; AFOSR-84-0002TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

The Radon transform is the mathematical basis of computed tomography. The two-dimensional (2D) Radon transform consists of a series of 1D projections of a 2D function, obtained by integrating the function along lines, while the 3D Radon transform consists of 1D projections of a 3D function, obtained by integrating over planes. In both cases, the transform serves to reduce the dimensionality of a function from 2D or 3D to 1D. For signal-processing applications, this dimensionality reduction is very useful because of the availability of sophisticated processing devices, such as SAW and CCD filters, for 1D time signals. The Radon transform permits the use of these devices with 2D and 3D data sets. The operations that can be performed with the help of the Radon transform include: convolution, correlation, Fourier analysis, bandwidth compression, space-variant filtering, adaptive filtering, calculation of the Wigner distribution and ambiguity function, and calculation of moments of an image. In all of these cases, the operations can be carried out on a 2D or 3D data set by first performing a Radon transform, then doing a sequence of 1D operations, and finally performing an inverse Radon transform. GRA

N84-20344# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
LARGE ENHANCEMENT OF THE SAGNAC EFFECT BASED ON NONLINEARLY INDUCED NONRECIPROCITY Final Report, 1 Apr. 1982 - 31 Mar. 1983
A. Kaplan 30 May 1983 19 p
(Grant AF-AFOSR-0126-82; AF Proj. 2305)
(AD-A137080; AFOSR-83-1295TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

A substantial enhancement (by orders of magnitude) of the Sagnac effect in a passive ring resonator can be attained by using a nonreciprocal feedback. This feedback is based on the nonreciprocal element controlled by the signal proportional to the difference between intensities of counterpropagating waves, and is an opto-electronic analog of nonlinear nonreciprocity proposed by us earlier. Under some critical conditions, this system can exhibit directional bistability and directional switching of the counterpropagating waves. Author (GRA)

N84-20345# California Univ., San Diego, La Jolla. Dept. of Electrical Engineering and Computer Sciences.
FABRICATION AND EVALUATION OF CHIRPED GRATING LENSES IN LITHIUM NIOBATE WAVEGUIDES Interim Report, 1 Jun. 1982 - 31 Sep. 1983
S. Forouhar, C. Warren, R. X. Lu, and W. S. C. Chang 1 Oct. 1983 162 p
(Grant AF-AFOSR-0037-80; AF Proj. 2305)
(AD-A137103; AFOSR-83-1314TR) Avail: NTIS HC A08/MF A01 CSCL 20/6

Theoretical methods have been formulated for the design and analysis of chirped grating lenses on planar optical waveguides. Various fabrication techniques such as deposition of high index titanium dioxide films and reactive ion milling of LiNb03 have been developed to create low-loss phase shift pads on Ti-indifused LiNb03 waveguides. GRA

N84-20346# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
PRECISION MEASUREMENTS OF LINE POSITIONS AND PROFILE AT A WAVELENGTH OF TEN MICROMETERS [PRAEZISIONSMESSUNGEN VON LINIENPOSITIONEN UND - PROFILEN BEI 10 MICROMETERS WELLENLAENGE]
Ulrich Schrey Jul. 1983 97 p refs In GERMAN
(MPE-180; ISSN-0340-8922) Avail: NTIS HC A05/MF A01

Position and profile of molecular absorption lines in the infrared were investigated in order to obtain information about pressure and temperature of astronomical objects. A laser sideband spectrometer with high resolution was developed. Light of a CO2 laser is modulated with microwave frequencies using the electro-optical effect. The spectrometer was tested on position and profiles of absorption lines of the molecules NH3 and C2H4 and shows a resolution of 3 million. Measurements on CH3F show that the sideband laser is a suitable local oscillator for astronomical heterodyne spectrometers. Author (ESA)

N84-20347# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Lasertechnik.
INVESTIGATION OF THE SIMULTANEOUS APPLICATION OF COMBINED OPTICAL ADAPTIVE TECHNIQUES (COAT) AND ANGLE TRACKING
Friedrich Malota May 1983 51 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-844)
(DFVLR-FB-83-17; ESA-TT-844) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 17,50

Combined application of coherent optical adaptive techniques (COAT) and angle tracking is investigated. The control signals for the adaptive optics were deduced by calculating the diffraction figures with two dephased waves. The calculations were carried out for a two-segment mirror while qualitative data were worked out for a four-segment mirror. Experiments were made with a five-segment mirror which in fact is a four-segment COAT mirror because of the securing of the center segment. It is shown that theoretical considerations and experimental results coincide for mirror positions. Author (ESA)

N84-20348# AEG-Telefunken, Wedel (West Germany). Fachgebeit Optronik.
PROCESSING OF OPTICAL GRAY VALUE PATTERNS Final Report, Sep. 1982
Gerhard Schoene Bonn Bundesministerium fuer Forschung und Technologie Oct. 1983 94 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-DV-83-003; ISSN-0170-9011) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20

Gray value image processing is reviewed. An equipment for real-time image preprocessing, image preanalysis and pattern recognition with the aid of connected image stores was developed. Industrial and military applications were tested. Besides the effective gray level image processing for difficult optical environmental conditions this procedure allows a real-time control of quick industrial processes, e.g., in case of conveyors with cycles from 20 to 100 msec. Author (ESA)

N84-20349# AEG-Telefunken, Heilbronn (West Germany).
INFRARED DEVICES FOR CONTROL APPLICATIONS Final Report, Sep. 1982
Werner Schairer Bonn Bundesministerium fuer Forschung und Technologie Nov. 1983 55 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-247; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,50

Infrared emitting and sensitive devices for remote control of household or industrial appliances are described. An Si-doped

infrared emitting diode made of GaAlAs for an emitted wavelength of 880 nm was developed. By optimizing the liquid phase epitaxy a radiative power of 21 mW at 100 mA forward current is obtained, with maximum values up to 23 mW at 100 mA. The linearity of the radiative power up to currents of 1.5 A is better than with GaAs:Si diodes. Internal efficiencies up to 58% are obtained. The best emitted wavelength can be shifted between 900 and 750 nm, the radiative power, however, decrease by a factor 3, whereas the half-width of the spectrum increases. A quadrant detector was developed with high sensitivity in the 1.0 micron range. The quantum efficiency is higher than 50% between 630 and 1080 nm and reaches up to 90% at 950 nm. A line voltage sensor based on optoisolator switching at low input currents between 1 and 2 mA is described. Author (ESA)

N84-19452# Institute of Space and Astronautical Science, Tokyo (Japan).
MEASUREMENT OF INCIDENCE ANGLE DEPENDENCE OF SOLAR ABSORPTANCE
A. Ohnishi and T. Hayashi *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 467-470 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-20350# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NEOCLASSICAL TRANSPORT ASSOCIATED WITH COLLISIONLESS DETRAPPING IN A BUMPY TORUS
D. E. Hastings Oct. 1983 18 p refs
(IPPJ-651) Avail: NTIS HC A02/MF A01

In the two collisionality nonresonant regime in a bumpy torus, the transitional particles can make a large contribution to neoclassical transport. This contribution can be moderated by the toroidally induced radial drift which causes transitional particles to detrap and retrap in the mirror sectors. A particle whose midplane pitch angle is such that initially it is trapped, will stall in the mirror throat, then drift poloidally and radially until its angle has changed enough to become a passing particle, then travel around the torus to be retrapped in one of the mirrors. The effect leads to linear diffusion coefficients in collision frequency and scale with the inverse aspect ratio instead of the more usual square of the inverse aspect ratio. M.A.C.

N84-20351# Nagoya Univ. (Japan). Dept. of Electrical Engineering.
EFFECT OF LOWER HYBRID WAVE HEATING ON ALPHA-PARTICLE DYNAMICS
Sho Ji Tanaka, Shuichi Takamura, Ryo Sugihara, and Takayoshi Okuda Oct. 1983 34 p refs
(IPPJ-649) Avail: NTIS HC A03/MF A01

Effects of lower hybrid wave (LHW) heating on alpha particle dynamics in a large Tokamak such as TFTR are investigated numerically. By use of a single particle code which includes the interaction with LHW, the diffusion coefficients of the particles in real and magnetic moment spaces are evaluated. The characteristic feature of the wave-particle interaction is that the alphas interact with almost whole poloidal cross-section of the wave due to their large Larmor radii. It is found that LHW heating causes spatial diffusion as well as velocity diffusion and the characteristic time of orbit loss due to stochastic diffusion of the alpha particles with rather large banana width is of the order of or shorter than their slowing-down time. M.G.

N84-20352# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ICRF HEATING EXPERIMENTS ON JIPP T-II
M. Ichimura, J. Fujita, S. Hirokura, E. Kako, K. Kawahata, Y. Kawasumi, A. Nishizawa, N. Noda, I. Ogawa, and K. Ohkubo Oct. 1983 27 p refs
(IPPJ-650) Avail: NTIS HC A03/MF A01

Data from JIPP T-II ion cyclotron frequency heating experiments are presented. The experiments cover three typical cases: the low concentration hydrogen minority case, the high concentration hydrogen minority case, and the (3)He minority case. The best heating efficiency is obtained for the (3)He minority case. It is shown through power balance analysis that the two H minority cases are different in the wave energy deposition profile. The difference is explained by the presence of a local cavity mode in the high concentration minority case. The ion temperature stops rising at a power density level of 0.65 W/cu cm. An analytic solution of the Fokker-Planck equation is derived to interpret the deterioration of heating efficiency. M.G.

N84-20353# Nagoya Univ. (Japan). Inst. of Plasma Physics.
TRANSPORT STUDIES OF ECH HEATED BUMPY TORUS PLASMAS
D. E. Hastings (ORNL) and T. Kamimura Oct. 1983 20 p refs
(IPPJ-652) Avail: NTIS HC A02/MF A01

A model of the measured potential profile in an electron cyclotron (ECH) heated bumpy torus is used in the radial transport equations for bumpy tori. The particle and energy confinement time are predicted along with the ECH power, ion temperature and neutral density necessary for a steady state to be maintained. M.G.

N84-20354# Nagoya Univ. (Japan). Inst. of Plasma Physics.
DYNAMICALLY ACCELERATED SUPERTHERMAL ELECTRONS IN MICROWAVE PLASMA INTERACTION
Y. Nishida, M. Yoshizumi, and R. Sugihara Oct. 1983 18 p refs
(IPPJ-648) Avail: NTIS HC A02/MF A01

Superthermal electrons produced by the resonance absorption of an obliquely incident electromagnetic wave are accelerated further by applying a weak magnetic field in a nonuniform plasma. The experimental results are interpreted by a new acceleration mechanism of v sub p x B sub o acceleration, where v sub p is a wave phase velocity. Author

N84-20355# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EXPERIMENTAL STUDIES ON PLASMA CONFINEMENT IN NAGOYA BUMPY TORUS
H. Ikegami, M. Fujiwara, T. Kamimura, H. Iguchi, T. Shoji, M. Hosokawa, M. Tanaka (Kyushu Univ., Fukuoka, Japan), K. Takasugi, F. Tsuboi, H. Tsuchidate et al Oct. 1983 34 p Presented at the Course and Workshop on Mirror-based and Field-reversed Approaches to Magnetic Fusion, Varenna, Italy, 12-17 Sep. 1983
(IPPJ-655) Avail: NTIS HC A03/MF A01

Plasma confinement in the Nagoya Bumpy Torus (NBT-1M) is studied. The applicability of the neo-classical diffusion theory to the existing device is particularly addressed. From numerical studies on the drift orbits of particles with the actual wall boundary, it is concluded that the neoclassical theory cannot be valid for the whole plasma volume unless a large radial electric field exists. For better confinement, a bumpy torus configuration using Inverse Dee coils is proposed. From the viewpoint of such confinement characteristics, experiments are made on the production and heating of the Nagoya Bumpy Torus plasma. Ion cyclotron heating can successfully produce a plasma temperature as high as 1.5 keV for the bulk ions with moderate density. Author

N84-20356# Nagoya Univ. (Japan). Inst. of Plasma Physics.
BUILDUP AND SUSTAINMENT OF 10(13) AND cm(-3) PLASMA BY ICRF IN RFC-XX
T. Sato, S. Okamura, K. Adati, T. Aoki, D. R. Baker, H. Fujita, H. R. Garner, K. Hattori, S. Hidekuma, T. Kawamoto et al Oct. 1983 24 p refs Presented at the US-Japan Workshop on Advanced Bumpy Torus Concepts, Rancho Santa Fe, Calif., 11-13 Jul. 1983
(IPPJ-653) Avail: NTIS HC A02/MF A01

A high density plasma is produced in the central section of RFC-XX by rf fields in the ion cyclotron frequency range. The magnetic field configuration of the central section is a solenoid or a mirror. An externally injected plasma or an Electron Cyclotron

Heating (ECH) produced plasma is used as a start-up plasma. A rotating type III antenna applied the rf fields to develop and sustain a high density plasma. The rotating type-III antenna can excite the left-hand circularly (m = -1), the right-hand circularly (m=+1), or the linearly (m= + or = 1) polarized wave. In general, the m=+I excitation can produce higher density (up to 7 x 10 to the thirteenth power/cu.cm.) and rather low ion temperature (30 to 50 eV) plasmas, and the m=-I excitation can produce higher ion temperature (100 to 150 eV) and moderate density approximately 50 microseconds plasmas. The plasma is sustained for the duration of the rf pulse and gas puffing (approximately 50 microseconds). This method is applicable to various kinds of magnetic fusion experimental devices. M.A.C.

N84-20357# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

PROCEEDINGS OF THE 3RD INTERNATIONAL WORKSHOP ON PLASMA FOCUS RESEARCH

Sep. 1983 150 p refs Workshop held in Stuttgart, 12-13 Sep. 1983

(IPF-83-6) Avail: NTIS HC A07/MF A01

Plasma focus devices, particle acceleration, particle beams, energy spectra, zeta pinches, plasma diagnostics, plasma dynamics, breakdown, plasma turbulence, laser light scattering, and plasma focus reactors were discussed. For individual titles, see N84-20358 through N84-20386.

N84-20358# Institute of Plasma Physics and Laser Microfusion, Warsaw (Poland).

REVIEW OF PLASMA FLOW RESEARCH AT THE INSTITUTE OF PLASMA PHYSICS AND LASER MICROFUSION (IPPLM)

Slawomir Denus *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 11-16 refs (For primary document see N84-20357 10-75)

Avail: NTIS HC A07/MF A01

Investigations of early phases of plasma discharge, (including breakdown and rundown of the sheath) radial collapse, pinch, instability and disintegration are described. Current sheath studies with and without an insert which shortened insulator length are summarized. Time of plasma column expansion and of instability growth were measured, using X-ray pinhole, three-frame visible, and four-frame interferometry cameras. Ion energy spectra were obtained from magnetic spectrometry, with and without an external magnetic field. Author (ESA)

N84-20359# Institute of Nuclear Research, Swierk (Poland).

PRELIMINARY INVESTIGATIONS OF 360 kJ PLASMA FOCUS DEVICE, PART 2

Andrzej Jerzykiewicz, M. Bielik, Zbigniew Jankowicz, K. Kociecka, L. Kocinski, J. Kucinski, B. Lipinski, Marek Sadowski, J. Witkowski, W. Wyszynski et al *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 17-20 refs (For primary document see N84-20357 10-75)

Avail: NTIS HC A07/MF A01

Neutron yield as a function of storage bank energy, obtained by a plasma focus device are shown. Neutron yield as a function of current amplitude and current after collapse, and the time resolved neutron pulse are reported. Radial velocity, pinch life time, and pinch diameter are presented as functions of neutron yield. Collector waveform currents and voltages for pressures at which multiple pinches are formed are shown. An X-ray pinhole picture for a single test shot taken at 63 kJ showing dimensions of a soft X-ray emitting zone is reproduced. A map of ion beams emitted along the symmetry axis of the plasma focus facility for a single test shot at 63 kJ is given. Author (ESA)

N84-20360# Osaka Univ. (Japan). Inst. of Laser Engineering.

DENSE PLASMA FOCUS RESEARCH AT THE INSTITUTE OF LASER ENGINEERING, OSAKA (JAPAN)

Masahiro Yokoyama, Y. Yamamoto, A. Kisoda, Y. Yamada, Y. Kitagawa, M. Yamanaka, and C. Yamanaka *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 21-24 refs (For primary document see N84-20357 10-75)

Avail: NTIS HC A07/MF A01

Research using a 50 kV/50 kJ deuterium plasma focus with 1.25 MA maximum current is summarized. Plasma dynamics in implosion phase of dense plasma focus were investigated by 2nsec ruby laser holographic interferometry and shadowgraphy. Radial pinch velocity of the plasma column and ionizing front velocity are 20 million cm/sec. Rayleigh-Taylor instability is observed in the early stage of the implosion phase. Effects of CO2 laser light on a dense plasma focus are discussed. High energy deuteron intensity, energy spectrum, and angular distribution were measured from radioactivity induced in graphite, aliminum and copper in ion dominant low pressure mode and neutron dominant high pressure mode. Author (ESA)

N84-20361# Tsinghua Univ., Beijing (China). Gas Discharge Lab.

PLASMA FOCUS RESEARCH IN CHINA

Yang Jinji *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 25-30 refs (For primary document see N84-20357 10-75)

Avail: NTIS HC A07/MF A01

Research on plasma focus engineering problems (spark gaps and transmission cables) and on plasma focus phenomena is summarized. Silicon rubber was used on both ends of the transmission cable to reduce the length of insulation. Spark gap characteristics were improved by changing electrode dimensions. Emission of X-rays was studied on a 99 F, 25 kV device, filled with H2 at 2 to 8 Torr. Early phases of discharge development were studied. Plasma-metal interactions were investigated. Author (ESA)

N84-20362# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Angewandte Physik.

RADIATION AND PARTICLE EMISSION FROM A 1.6 kJ PLASMA FOCUS

G. Herziger, R. Noll, K. Ruehl, K. Schmitt, L. Michel, and H. Krompholz *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 31-34 refs (For primary document see N84-20357 10-75)

Avail: NTIS HC A07/MF A01

Electron beams, ion beams, and periodic structures of electron density associated with a 1.6 kJ plasma focus are described. The distinct nonlinear and periodic modulation of the electron beam and the distinct terms superimposed on the energy distribution of the ions are strong indications that the particles are accelerated in the field of coherent plasma waves. By onset of an m = 0 instability the plasma gets increasingly compressed, and a constant current is forced through the converging plasma by the external circuit. The further development is distinguished by onset of microinstabilities which modulate the plasma density periodically. Due to the periodic plasma structure the diffusion velocity of the magnetic field is enhanced. The particles traveling in a cyclotron drift motion are accelerated by the rapidly penetrating magnetic field. When the magnetic energy is consumed by the acceleration process the force balance does not hold any longer and electrons and ions are simultaneously emitted in opposite directions. Author (ESA)

N84-20363# Gunma Univ., Maebashi (Japan). Dept. of Electronic Engineering.

MACROSCOPIC PLASMA BEHAVIOR AND CHARGED PARTICLE ACCELERATION IN THE PLASMA FOCUS

Katsumi Hirano, K. Shimoda, T. Yamamoto, M. Sato, K. Kobayashi, and H. Misaizu *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 35-38 refs (For primary document see N84-20357 10-75)

Avail: NTIS HC A07/MF A01

Time correlations between the macroscopic behavior of plasma and the emission of deuteron beam, X-ray and neutrons are summarized. After collapse the plasma column is partially disrupted by an m = 0 instability. Deuteron emission begins in the collapse phase. Emission of X-rays and neutrons starts within 30 nsec of the disruption of plasma column. Then the disrupted region extends

to the downstream direction with time. The peak of neutron emission occurs after the disruption (50 to 80 nsec). However, there is no direct correlation between growth of the m = 0 instability and the neutron yield. The acceleration of the ion beam, which causes neutron production is generated not by a rapid change of the plasma inductance but by an abrupt rise of resistivity in the plasma. The plasma current, which was confined in the sheet cylindrically, diffuses after the disruption. Author (ESA)

N84-20364# Institute of Nuclear Research, Swierk (Poland).
STUDIES ON ION BEAMS PRODUCED IN A PLASMA FOCUS, PART 2
Marek Sadowski, S. Chyrczakowski, W. Komar, E. Rydygier, and J. Zebrowski *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 39-42 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Information on high energy deuteron beams is given. The hypothesis of the ion generation from many point-like sources, emitting microbeams of different energy, is confirmed. Zeeman measurements of an average magnetic field in a pinch region and results of time-resolved ion measurements are presented.
Author (ESA)

N84-20365# Associazione EURATOM-CNEN Sulla Fusione, Frascati (Italy). Centro Ricerche Energia.
PLASMA FOCUS EVOLUTION IN TIME AS SEEN FROM ITS NEUTRON, GAMMA AND X RAY ACTIVITIES
J. S. Brzosko, J. Klobukowska, and B. V. Robouch *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 43-46 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Neutron, gamma, and X-ray radiation intensity time evolution was investigated in a 1 MJ plasma focus using time-of-flight signal analysis and X-ray detectors. Typical features averaged over several shots are summarized. It is noted that neutron emission occurs during two well separated time intervals. The two neutron events are weakly correlated. Author (ESA)

N84-20366# Maryland Univ., College Park. Lab. for Plasma and Fusion Energy Studies.
CHARGE STATE RESOLVED ENERGY SPECTRA OF He, N, Ar, AND Ne IONS
M. J. Rhee, C. M. Luo (Tsinghua University, Peking), R. F. Schneider, and J. R. Smith (Naval Surface Weapons Center, Silver Spring, Md.) *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 47-50 refs Sponsored by AFOSR, DOE and IR (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Ions of He, N, Ar, and Ne were produced in a plasma focus device with a current charged transmission line, and their charge states were analyzed using a Thomson spectrometer. The charge state resolved energy spectra are constructed for the same ions from the track density distribution on the Thomson parabolas. Up to triply ionized ions are found in all species except helium. By counting the tracks of the parabolas on a track detector, the charge state resolved energy spectra are constructed for the same ions. The spectra of different ion species and charge states are similar to each other. Author (ESA)

N84-20367# Maryland Univ., College Park. Lab. for Plasma and Fusion Energy Studies.
STUDY OF ELECTRON BEAM PRODUCTION BY A PLASMA FOCUS
J. R. Smith (Naval Surface Weapons Center, Silver Spring, Md.), C. M. Luo (Tsinghua University, Peking), M. J. Rhee, and R. F. Schneider *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 51-54 refs Sponsored by AFOSR, DOE and IR (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

The electron beam produced by a plasma focus device using a current charged transmission line was investigated. Electron beam currents as high as 10 kA were measured. Interaction of the extracted beam and the filling gas was studied using open shutter photography. Author (ESA)

N84-20368# Institute of Plasma Physics and Laser Microfusion, Warsaw (Poland).
A DIODE MODEL OF HIGH ENERGY PARTICLE EMISSION IN THE PLASMA FOCUS DEVICE
A. Farynski and A. Gacek *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 55-58 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

A model of high energy charged particle emission based on the assumption that a double layer of high impedance is created in the plasma column is proposed. The sheath is created when the MHD instability m = 0 causes a necking of the plasma column. At the moment when the current density in the necking exceeds a given value, a depression instability is created forming the double layer of high impedance and thus a high electric voltage and high energy charged particles. Model results for various initial conditions are presented. Energies obtained by ions amount to 10 MeV. The high voltage pulse duration amounts to several nanosec. A fine structure voltage of the diode causes a similar structure in the ion and electron spectra. In the charged particle spectrum, a sharp upper confine is observed. The maximum energy of ions is lower than that of electrons because of a longer acceleration time. The diode voltage frequency spectrum extremum is in the region below 1000 MHz and close to 30 GHz. Author (ESA)

N84-20369# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Angewandte Physik.
PARTICLE ACCELERATION BY ELECTRON PLASMA WAVES
W. Schneider *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 59-62 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Suprathermal electron acceleration in laser plasmas and plasma focuses by a longitudinal wave is studied by solving the electron equation of motion for a given wave field. Different kinds of amplitude functions are considered. Wave pressure, trapping, and initial velocity < 2 are considered. Final velocity versus initial velocity for a weakly space dependent envelope, time averaged electron energy in the wave frame versus wave amplitude for different values of the initial energy, velocity distribution function of the accelerated particles for final-initial velocity distribution; and final velocity versus. Initial velocity for a steeply rising field are shown. Author (ESA)

N84-20370# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
ION AND NEUTRON EMISSION OF THE POSEIDON PLASMA FOCUS
Hellmut Schmidt *In its* Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 63-66 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/ A01

Ion and neutron emission were studied in a 280 kJ 60 kV plasma focus. Multiple small ion sources emitting deuterons in the energy range below 2 MeV are found in the pinch region. High energy components in the deuteron energy distribution decrease more with energy for large pinch currents than for small. The time behavior of the neutron emission is also strongly influenced. At high discharge currents neutron emission is partially shifted to the macroscopically stable pinch phase, which lasts longer with increasing pinch current. A second pulse occurs after the onset of m=0 instabilities. These two neutron pulses exhibit different properties as to spatial anisotropy and their contribution to the neutron yield. A first region emitting 70% of the reaction protons coincides with the pinch region, the remainder are emitted from a region extending up to 15 cm above the anode.
Author (ESA)

N84-20371# Los Alamos Scientific Lab., N. Mex.
HIGH DENSITY Z-PINCH RESEARCH

Jack S. Schlachter *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 67-70 refs Previously announced as N84-14013 Sponsored by DOE (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

A modification of the conventional Z-pinch approach is outlined. The density regime is 10 to the 26th power/cum, with a 1/million sec confinement time. The plasma is initiated in the center of a large chamber filled with neutral gas by a Q-switched laser. This removes the problem of wall-related impurities and may generate a pressure profile which is m=0 stable. Laser initiation helps to set the spatial (radial) scale of the plasma. A coronal region surrounding the plasma column possibly provides stabilization against m=1 kink mode development. Experiments show that plasmas lack gross MHD instabilities. Author (ESA)

N84-20372# Imperial Coll. of Science and Technology, London (England).
THE Z-PINCH PROGRAM AT IMPERIAL COLLEGE
M. G. Haines, A. E. Dangor, A. Folkierski, E. Kahan, E. Lindman, W. G. Bessel, D. J. Bond, C. D. Challis, P. Choi, and M. Coppins *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 71-73 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

A Z-pinch program comprising a compression Z-pinch, a laser-initiated gas embedded Z-pinch, and a gas-puff Z-pinch is outlined. Theoretical work on particle orbits and energy balance, large ion Larmor radius stability calculations, a kinetic ion simulation of ion beam formation due to the m=0 instability, a 1-D time dependent simulation with atomic physics, and a study of the possible evolution of a helical minimum energy state are summarized. Author (ESA)

N84-20373# Duesseldorf Univ. (West Germany). Institute of Physics 1.
SCHLIEREN DIAGNOSTICS AT SPEED 1
G. Decker, W. Kies, G. Pross, and J. Rybach *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 75-78 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

A Schlieren method with subnanosecond time resolution was used to investigate plasma dynamics and sheath and pinch dimensions. Results show that sheath and pinch dimensions of SPEED 1 are smaller than conventional foci by one order of magnitude. Typical compression velocity for shots of high neutron yield is 0.4 mm/nsec; axial sheath velocity is smaller by a factor of 3. Pressure dependance of radial velocity is strong, that of axial velocity weak. Sheath thickness can be measured from the distance of the two density gradients; typical thickness is 0.6 mm. In shots without neutron production only one gradient is visible. Shots with very high neutron yield are correlated with longitudinal structures of the sheath Schlieren picture. Minimum pinch radii down to 0.1 mm are measured. Typical pinch length is < 5 mm. In the low pressure range the collapsing plasma sheath is highly structurized. In the high pressure range $m = 0$ macroscopic instabilities of the pinch column are observed. Author (ESA)

N84-20374# Duesseldorf Univ. (West Germany). Inst. of Physics 1.
BREAKDOWN PHENOMENA IN SPEED 1
Gernot Decker, W. Kies, J. Rybach, and G. Pross *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 79-82 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

In the fast high voltage focus SPEED 1, very thin current sheaths of high electrical conductivity were generated, and parameters for the sheath formation and the strong interrelation of breakdown and pinch phase were found. Fast high voltage breakdown homogenizes the formation of the current sheath. High ignition voltage favors the concentration of electrons on the insulator surface prior to breakdown leading to the formation of thin current sheaths close to the insulator. High rate of change of current during breakdown reduces the thickness of the generated sheath. Thin current sheaths and high absolute current level lead to high sheath current densities and thus high sheath conductivities. Author (ESA)

N84-20375# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Angewandte Physik.
A PLASMA FOCUS WITH IMPROVED REPRODUCIBILITY
C. R. Haas, G. Herziger, W. Neff, and W. Schneider *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 83-86 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

A device to produce a homogeneneous plasma layer and reproducible plasma focus is described. Spark gap and main discharge are triggered simultaneously by a high voltage pulse with a rise rate of 15 kV/nsec. During spark gap formation there is a sufficient power flux to the focus discharge from the trigger generator, giving a uniform plasma. The peak intensity of soft X-ray emission is shown. In 50% of events jitter is < 3 nsec. Author (ESA)

N84-20376# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Angewandte Physik.
DYNAMICS OF MICROSTRUCTURES
C. R. Haas, G. Herziger, R. Lebert, and R. Noll *In* Stuttgart Univ. Proc of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 87-90 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Plasma dynamics and structures in a 1.6 kJ plasma focus device were investigated by streak cameras, Schlieren diagnostics, IR and X-ray measurements. The similarity of collapse and expansion suggests an undisturbed mutual penetration of the plasma layer at the focus axis. With increasing hard X-ray intensity a faster temporal evolution of the focus phase is observed, indicating enhanced diffusion of magnetic field energy into the locally compressed plasma. Regular density modulations in the collapse and focus phase are observed. The angular distribution of the radiation emitted by relativistic electrons propagating in a periodic potential or density structure is confined to a narrow cone in the direction of motion. The IR measurements show enhanced suprathermal emission around 13 microns. Author (ESA)

N84-20377# Institute of Nuclear Research, Swierk (Poland).
THE OPTIMIZATION METHOD FOR THE MATHER PLASMA FOCUS DEVICE
Zbigniew Jankowicz *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 91-94 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Calculations and analysis of dimensionless equations of a 2D snowplow are presented. In order to reach the maximal current value during the axial phase it is necessary to assure that L/sq root LO/CO is as small as possible, and that the current maximum occurs at the instant when the current sheet reaches the end of the inner electrode. The growth of the inductance during the radial phase must be as small as possible. The current singularity depth should be caused first by the radial compression of the plasma, not by the axial movement of the current sheet front. At the instant of the radial compression initiation the value of the additional Imshennik's parameter should be strictly defined. Author (ESA)

N84-20378# Academy of Sciences (USSR), Moscow. Inst. of Physics.
MICROPINCH PHENOMENON IN DENSE Z-PINCH
O. G. Semenov *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 95-98 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Radiative collapse dynamics of a hydrogen (deuterium) plasma column in zeta pinch discharge is discussed. A mechanism for Z-pinch collapse due to radiative losses of plasma energy is proposed. The plasma implodes when energy escaping from the plasma is less than Joule heating. A second implosion of the

neck occurs after its reexpansion. Enchanced plasma blowoff provokes anomalous resistivity development due to low hybrid instability, which results in fast heating and explosion of the micropinch. The micropinch region is a powerful source of soft X-rays. Author (ESA)

N84-20379# Research Inst. of National Defence, Stockholm (Sweden).
CURRENT TUBE DESCRIPTION OF THE FOCUS PLASMA
E. A. Witalis *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 99-102 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

The validity of a current tube plasma description is discussed and the classical theory of magnetically interacting, resistive, and deformable line current conductors is applied. Analysis results emphasize the necessity of magnetic energy accommodation by tube deformations, preferably helical, if mechanical energy is to be imparted upon them. Energy transfers during focus discharge stages are considered. The generalized Bennett relation combined with the magnetically induced plasma rotation effect are shown to explain current filamentation and magnetized plasma whirl formation as fundamental plasma properties, in accordance with observations. Implications for the plasma focus operation are pointed out. Author (ESA)

N84-20380# Research Inst. of National Defence, Stockholm (Sweden).
FILAMENTATION IN THE PLASMA FOCUS AS A PLASMA MEISSNER EFFECT
E. A. Witalis *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 103-106 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

An assertion that magnetized plasmas, in particular focus plasmas, exhibit features similar to the Meissner effect is reviewed. It is proved to be correct by avoiding two common mistakes. One is neglect of the Hall effect, the other is a conservation theorem disregarding the noncentral character of the internal particle-particle forces maintaining plasma charge neutrality. Author (ESA)

N84-20381# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
THEORETICAL TREATMENT OF TURBULENT PLASMA DYNAMICS
H. J. Kaeppeler, A. Hayd (M.A.N., Munich), and Martin Maurer (M.A.N., Munich) *In its* Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 107-110 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

A four-component theory of turbulent magnetoplasmadynamics is outlined, and calculations for the POSEIDON plasma focus are discussed. The dense high-current carrying plasma in the focus is characterized by macro and micro instabilities causing anomalous dissipation, and by high magnetic and electric fields. This necessitates a calculation procedure considering the dispersive behavior of the plasma, and description of the plasma as a four-component fluid, in order to consider the acceleration of ions and electrons in the strong fields. As the time scales for the microscopic and macroscopic phenomena differ by several orders of magnitude, micro effects are treated analytically, giving closed solutions. Macroscopic flows are solved by a combined analytical/numerical combination code REDUCE/FORTRAN. Microturbulence is considered in a quasi linear approximation, while the REDUCE/FORTRAN code permits a complete nonlinear approach via a macroscopic dispersion relation. Author (ESA)

N84-20382# Man-Turbomotoren G.m.b.H., Munich (West Germany).
LASER-PLASMA INTERACTION AND SELF ORGANIZATION PHENOMENA IN MAGNETOPLASMAS
Peter Meinke, A. Hayd, and Martin Mauerfr *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 111-117 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Self organization and phase transitions in highly turbulent plasmas are discussed. A two-component theory which includes continuity equations, Navier-Stokes equations, Maxwell's equations, energy equations for ion and electrons, and generalized Ohm's law is summarized. Turbulence-stabilized forms of magnetoplasma created in the plasma focus are described. Augmentation of neutron yield in highly turbulent plasmas by signal inputs from Q switched lasers is outlined. Author (ESA)

N84-20383# United Kingdom Atomic Energy Authority, Culham (England). Culham Lab.
LASER LIGHT SCATTERING FROM DENSITY FLUCTUATIONS IN THE CULHAM FOCUS
R. E. Kirk (London University), M. J. Forrest, D. G. Muir (London University), and N. J. Peacock *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 119-122 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

The ion feature in the spectrum of laser light scattered from a dense plasma focus was recorded synchronously for three different scattering vectors and two values of the scattering parameter. The electron drift parameter derived from the relative blue shift of the spectrum from the sheath region is significant and can approach the electron thermal velocity Polarimetry however indicates that the ratio of electron drift to thermal velocity is $< < 1$ during the collapse phase. These contradicting conclusions can be reconciled by postulating filamentation of the current in the sheath region. During the period $t = 0$ to $+ 15$ nsec there is rapid, anomalous diffusion of the poloidal magnetic field into the core region. During the period following anomalous field diffusion polarimetry shows very clear evidence for short-lived beam currents flowing within a diameter < 250 microns. These beams are correlated with the very strong enhancement of the ion feature. Author (ESA)

N84-20384# Heidelberg Univ. (West Germany). Inst. fuer Angewandte Physik.
LASER LIGHT SCATTERING AT THE POSEIDON PLASMA FOCUS DEVICE
Gerhard Boeckle, Karl Matl, Norbert Wenzel, Robert Wolf, R. Baetzner, H. Hinsch, and K. Huebner *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 123-126 (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Thomson scattering measurements were performed at the POSEIDON plasma focus device. The angular distribution of the spectral integrated and the spectral resolved scattered light at one angle were observed simultaneously. Electron and ion temperature and electron density were determined. Nonthermal effects are found. One class of scattering spectrum can be fitted by theoretical curves according to the Salpeter approximation describing scattering in thermal plasmas. The other nonthermal spectra include k-spectra having only signals at small angles (k-type 1), k-spectra that can be fitted following the Salpeter theory but show enhanced scattering at small angles (k-type 2), and omega spectra with enhanced scattering near the ruby line. Author (ESA)

N84-20385# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Angewandte Physik.
OBSERVATION OF NONLINEAR PHENOMENA
G. Herziger, H. Krompholz, W. Neff, R. Noll, F. Ruehl, K. Schmitt, and B. Weil *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 127-130 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Mechanisms which lead to efficient particle acceleration in the plasma focus were studied by measuring the temporal structure and the energy spectra of the electron and ion beams, using a 1.6 kJ Mather device. Results indicate nonlinear three wave interaction in the focus plasma. This interaction can lead to simultaneous repetitive oscillations of the wave amplitudes if one of the interacting waves has negative energy, i.e., is able to release

energy while growing in amplitude. During the rising part of the amplitudes electrons and ions can be captured and accelerated in the potential of the waves and subsequently released during the falling part of the wave amplitudes. This assumption leads to a close relationship between the observed periodic emission of the electrons and the peaks in the ion energy spectra.
Author (ESA)

N84-20386# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
PROSPECTS OF THE PLASMA FOCUS FOR MAGNETIC FUSION
H. Herold and A. Hand *In* Stuttgart Univ. Proc. of 3rd Intern. Workshop on Plasma Focus Res. Sep. 1983 p 131-137 refs (For primary document see N84-20357 10-75)
Avail: NTIS HC A07/MF A01

Reactor energy balance and plasma modeling for a break even reactor are discussed. The positive prospects for a plasma focus reactor rest on the prediction that strong filamentation with increased current and plasma densities show up in a long living pinch plasma for pinch currents in the 5 MA range and voltages of MV. Possible strategies include developing focus pinch phase and using the quiet pinch for a long lasting containment of a plasma with high energy density; and developing the late pinch phase by cultivating the post m = 0 self organization phenomena (blobs, turbulence packets). Regarding the axial outflow, these phenomena have to be initiated at the very beginning of the pinch.
Author (ESA)

N84-20387# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.
DUAL MAXWELLIAN SPACE PLASMA MODELING BY THE LOGARITHMIC METHOD
A. L. Besse, A. G. Rubin, and M. F. Tautz 5 Jul. 1983 14 p
(AF Proj. 7661)
(AD-A137131; AFGL-TR-83-0169; AFGL-PSRP-667) Avail: NTIS HC A02/MF A01 CSCL 12/1

A common and useful practice in the study of spacecraft charging phenomena is the use of dual Maxwellian models of the particle distributions. These models frequently employ a least error fit to the logarithm of the measured distribution function over an energy range that may exceed three decades. By example, we demonstrate that the resulting models are not satisfactory for the calculation of spacecraft charging. The models do not have a sufficient number of adjustable parameters to fit the measured spectra over such a wide energy range. More satisfactory models are obtained by weighting the spectral data according to their relevance to the spacecraft charging phenomena under investigation. In addition, reasonable limits must be placed on the temperatures of the models to prevent the artifacts that have been experienced in a minority of cases.
Author (GRA)

N84-20388# California Univ., Berkeley.
LINEAR LONGITUDINAL OSCILLATIONS IN COLLISIONLESS PLASMA DIODES WITH THIN SHEATHS. PART 1: METHOD
S. Kuhn 31 Aug. 1983 51 p
(Contracts N00014-77-C-0578; DE-AT03-76ET-53064)
(AD-A136962; UCB/ERL-M83/52) Avail: NTIS HC A04/MF A01 CSCL 12/1

A method is proposed for treating linear longitudinal perturbations in one-dimensional collisionless plasma diodes with a uniform plasma region and thin electrode sheaths. The method is comprehensive in that it allows for very general equilibrium, initial, boundary, and external-circuit conditions.
GRA

N84-20389# California Univ., Berkeley. Plasma Theory and Simulation Group.
LINEAR LONGITUDINAL OSCILLATIONS IN COLLISIONLESS PLASMA DIODES WITH THIN SHEATHS. PART 2: APPLICATION TO AN EXTENDED PIERCE-TYPE PROBLEM
S. Kuhn (Innsbruck Univ.) 3 Oct. 1983 62 p Sponsored in part by Austrian Fonds sur Foerderung der Wissenschaftlichen Forschung
(Contracts N00014-77-C-0578; DE-AT03-76ET53064)
(AD-A136963; UCB/ERL-M83/61) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper constitutes Part 2 of a study proposing an integral-equation approach to linear longitudinal oscillations in collisionless plasma diodes with thin sheaths. The method was formally developed in Part I and is comprehensive in that it handles the combined initial-value and external-perturbation problem, thus including the eigenmode problem as a special case, and allows for explicit and simultaneous inclusion of three basic constituents of bounded plasma systems, namely the plasma itself, the boundaries, and the external circuit. The present restriction to one-dimensional diode geometry is not inherent to the integral-equation approach as such and is likely to become dispensable at a later stage of development of the theory. In this paper, the method developed in Part 1 is employed to solve an extended Pierce-type problem involving a non-trivial external circuit. The goal author's is to demonstrate the applicability and handling of the method, and to show the in numerical detail that the external circuit, an essential part of any bounded plasma system, may crucially influence the overall dynamic and stability behavior. GRA

N84-20390# New York Univ., New York.
KINETIC THEORY OF GASES, MAGNETO-FLUID DYNAMICS AND THEIR APPLICATION Interim Report, 1 Dec. 1981 - 30 Nov. 1982
Harold Grad Jan. 1983 24 p
(Grant AF-AFOSR-0020-81; AF Proj. 2304)
(AD-A137062; AFOSR-83-1347TR) Avail: NTIS HC A02/MF A01 CSCL 20/9

This paper describes research results and cites progress resulting from work performed during this period of the grant. The areas covered in this report are: (1) mathematical theory of turbulent fluctuations of a plasma near thermal equilibrium, (2) the theory of non-linear thermal and diffusive waves in finite mass and reacting media, (3) the development of algorithms for the Helmholtz equation, (4) progress in the development of theory for Queer Differential Equations, and (5) spectral theory of non-elliptic operators.
Author (GRA)

N84-20391# Harry Diamond Labs., Adelphi, Md.
THE TOTAL FIELD IN COLLECTIVE BREMSSTRAHLUNG IN A NONEQUILIBRIUM RELATIVISTIC BEAM-PLASMA SYSTEM
Howard E. Brandt Sep. 1983 33 p
(DA Proj. 1L1-61101-A-91A; HDL Proj. A10225)
(AD-A136595; HDL-TR-1996) Avail: NTIS HC A03/MF A01 CSCL 20/9

An expression is obtained for the total electric field associated with collective bremsstrahlung in a nonequilibrium relativistic beam-plasma system in the case of a slowly varying, nearly spatially independent background distribution with no external fields. The field is assumed to consist of an unperturbed regular part corresponding to the nonradiative part of the field of the particles and a stochastic part corresponding to the bremsstrahlung radiation field. The relations derived here are needed in calculations of collective bremsstrahlung processes and the conditions for the occurrence of bremsstrahlung radiative instability in relativistic beam-plasma systems.
GRA

N84-20392# Argonne National Lab., Ill. Fusion Power Program.
BLANKET COMPARISON AND SELECTION STUDY, VOLUME 1
Oct. 1983 458 p refs
(Contract W-31-109-eng-38)
(DE84-003657; ANL-FPP-83-1-Vol-1) Avail: NTIS HC A20/MF A01

The objectives of the Blanket Comparison and Selection Study (BCSS) are stated as follows: (1) Define a small number (approx. 3) of blanket design concepts that should be the focus of the blanket R and D program. A design concept is defined by the selection of all materials (e.g., breeder, coolant, structure and multiplier) and other major characteristics that significantly influence the R and D requirements. (2) Identify and prioritize the critical issues for the leading blanket concepts. (3) Provide the technical

input necessary to develop a blanket R and D program plan. guidelines for prioritizing the R and D requirements include: (a) critical feasibility issues for the leading blanket concepts will receive the highest priority, and (b) for equally important feasibility issues, higher R and D priority will be given to those that require minimum cost and short time. DOE

N84-20393# Oak Ridge National Lab., Tenn.
TOKAMAK PLASMA POSITION DYNAMICS AND FEEDBACK CONTROL
L. Burenko and J. M. Bailey (Tennessee Univ., Knoxville) 1983 6 p refs Presented at 10th Symp. on Fusion Engr., Philadelphia, 5 Dec. 1983
(Contract W-7405-eng-26)
(DE84-004424; CONF-831203-66) Avail: NTIS HC A02/MF A01

The perturbation equations of a Tokamak plasma equilibrium position are developed. Solution of the approximated pertubation equations is carried out. A unique, simple, and useful plasma displacement dynamics transfer function of a Tokamak is developed. The dominant time constants of the dynamics transfer function are determined in a symbolic form. DOE

N84-20394# Los Alamos Scientific Lab., N. Mex.
PLASMA ENGINEERING DESIGN OF A COMPACT REVERSED-FIELD PINCH REACTOR (CRFPR)
C. G. Bathke, M. J. Embrechts (Renssalaer Polytechnic Inst.), R. L. Hagenson (Technology International, Inc.), R. A. Krakowski, and R. L. Miller 1983 9 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-36)
(DE84-004334; LA-UR-83-3505; CONF-831203-47) Avail: NTIS HC A02/MF A01

The rationale for and the characteristics of the high-power-density Compact Reversed-Field Pinch Reactor (CRFPR) are discussed. Particular emphasis is given to key plasma engineering aspects of the conceptual design, including plasma operations, current drive, and impurity/ash control by means of pumped limiters or magnetic divertors. A brief description of the Fusion-Power-Core integration is given. DOE

N84-20395# Los Alamos Scientific Lab., N. Mex.
ELECTRICAL DESIGN OF A HIGH CURRENT DENSITY AIR-CORE REVERSED-FIELD PINCH ZTP
William A. Reass, Jimmy G. Melton, and Robert F. Gribble 1983 5 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-36)
(DE84-004321; LA-UR-83-3490; CONF-831203-46) Avail: NTIS HC A02/MF A01

The electrical design of a small, high current density (10 MA/m(2)) toroidal reversed-field Z-Pinch (RFP) presently being constructed at Los Alamos is described. Special purpose magnetic field programs were used to calculate self and mutual inductances for the poloidal field windings. The network analysis program MINI-SCEPTRE was then used to predict plasma current, including the interaction between toroidal and poloidal field circuits, as described by the Bessel function model for RFP's. Using these programs, coil geometry was obtained for minimal field errors and the pulse power systems were optimized to minimize equilibrium control power. Results of computer modeling and implementation of the electrical circuits are presented. DOE

N84-20396# Los Alamos Scientific Lab., N. Mex.
POLOIDAL FIELD SYSTEM DESIGN FOR THE ZT-H REVERSED FIELD PINCH EXPERIMENT
Kurt F. Schoenberg, Robert F. Gribble, Theodore W. Linton, and William R. Reass 1983 7 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-36)
(DE84-004328; LA-UR-83-3476; CONF-831203-43) Avail: NTIS HC A02/MF A01

This report discusses each of the following areas: (1) equilibrium specification, (2) the equilibrium winding, (3) the magnetizing winding, (4) numerical poloidal field system analysis, (5) coil cross section, turns, minimum field error, (6) coil stresses and cooling, (7) the upper structure, (8) the loads, (9) boundary conditions and method of analysis, and (10) design description. DOE

N84-20397# Illinois Univ., Urbana-Champaign.
STABLE ALFVEN WAVE DYNAMO ACTION IN THE REVERSED FIELD PINCH Ph.D. Thesis
Kenneth Alan Werley 1984 161 p refs
(Contract DE-AC02-76ET-52040)
(DE84-004986; DOE/ET-52040/296; COO-2218-296) Avail: NTIS HC A09/MF A01

Recent advances in linear resistive MHD stability analysis are used to calculate the quasi-linear dynamo mean electromotive force of Alfven waves. This emf is incorporated into a one-dimensional transport and mean-field evolution code. The changing equilibrium is then fed back to the stability code to complete a computational framework that self-consistently evaluates a dynamic plasma dynamo. Static quasi-linear Alfven wave calculations have shown that dynamo emfs on the order of eta J (product of resistance and current density) are possible. This suggested a possible explanation of reversed field pinch behavior and a new (externally driven) mechanism for extending operation and controlling field profiles (possibly reducing plasma transport). The dynamo emf can quickly induce plasma currents whose emf cancels the dynamo effect. Extensive studies of resistive Alfven wave properties, including behavior versus spectral location, magnetic Reynolds number and wave number were examined. DOE

N84-20398# California Univ., Livermore. Lawrence Livermore Lab.
RECONNECTIONS IN SPHEROMAK FORMATION AND SUSTAINMENT
J. H. Hammer 12 Dec. 1983 36 p refs Presented at the Chapman Conf. on Magnetic Reconnection, Los Alamos, N. Mex., 3 Oct. 1983
(Contract W-7405-eng-48)
(DE84-004157; UCRL-90109; CONF-8310229-4) Avail: NTIS HC A03/MF A01

The spheromak is a magnetic confinement device that is being explored in both the US and Japanese fusion programs. It is a member of the compact forus family of magnetic structures characterized by a set of closed, nested toroidal flux surfaces but without any coils, transformer cores, etc. protruding through the hole in the torus. The spheromak is closely related to the reversed field pinch (RFP) in that most of the magnetic field is produced by plasma currents flowing along the magnetic field lines (a near force free field) rather than by external coils. The spheromak has magnetic field components of comparable strength in bot the toroidal (azimuthal) and poloidal (in the plane perpendicular to the azimuthal unit vector) directions. The large internal magnetic energy in the spheromak makes it rich in magnetohydrodynamic phenomena and reconnection, in particular, plays an important role in the formation, resistive decay and instability processes. Reconnection plays an essential role in all phases of existence for the spheromak, including formation, slow decay, and rapid annihilation at the onset of instability. DOE

N84-20399# Los Alamos Scientific Lab., N. Mex.
TOROIDAL MAGNETIC FIELD SYSTEM FOR 2-MA REVERSED-FIELD PINCH EXPERIMENT
J. G. Melton and T. W. Linton 1983 7 p refs Presented at 10th Symp. on Fusion Engr., Philadelphia, 5 Dec. 1983
(Contract W-7405-eng-36)
(DE84-004322; LA-UR-83-3489; CONF-831203-45) Avail: NTIS HC A02/MF A01

The engineering design of the toroidal magnetic field (TF) system for a 2-MA Reversed Field Pinch experiment (ZT-H) is described. ZT-H is designed with major radius 2.15 meters, minor radius 0.40 meters, and a peak toroidal magnetic field of 0.85 Tesla. The requirement for highly uniform fields, with spatial ripple $< 0.2\%$ leads to a design with 72 equally spaced circular TF coils, located at minor radius 0.6 meters, carrying a maximum

current of 9.0 MA. The coils are driven by a 12-MJ capacitor bank which is allowed to ring in order to aid the reversal of magnetic field. A stress analysis is presented, based upon calculated loop tension, centering force, and overturning moment, treating these as a combination of static loads and considering that the periodic nature of the loading causes little amplification. The load transfer of forces and moments is considered as a stress distribution resisted by the coils, support structures, wedges, and the structural shell. DOE

N84-20400# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
TWO-DIMENSIONAL MHD BOUNDARY LAYERS IN ARGON-CESIUM PLASMAS
J. G. A. Arts and W. F. H. Merck Jul. 1983 155 p refs Sponsored by Netherlands Ministry of Economic Affairs, The Hague
(EUT-83-E-139; ISBN-90-6144-139-0; ISSN-0167-9708) Avail: NTIS HC A08/MF A01

A calculation method for two-dimensional MHD electrode boundary layers in an argon-cesium plasma, based upon the Patankar scheme, extended with electromagnetic terms in the gasdynamic equations is presented. A coarse model imposing a chosen jx and jy distribution within the boundary layer, and a two dimensional current potential distribution as a stationary solution of Maxwell's equations for each MHD generator segment, giving a neat current distribution within the boundary layer, are used. At high electromagnetic interaction the coarse model indicates boundary layer separation, in agreement with the sharp pressure rises measured in the downstream half of a generator duct. The calculations with neat current-potential distributions do not predict boundary layer separation. Author (ESA)

N84-19400# European Space Research and Technology Center, Noordwijk (Netherlands).
IRSIM: A PROGRAM FOR THE CALCULATION OF INFRARED FLUX INTENSITY INCIDENT ON A SPACECRAFT INSIDE A TEST CHAMBER
R. P. Rogers *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 27-37 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-20401*# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Electrical Engineering.
MATERIAL GROWTH AND CHARACTERIZATION FOR SOLID STATE DEVICES Annual Report, 1 Oct. 1982 - 30 Nov. 1983
E. K. Stefanakos, W. J. Collis, A. Abul-Fadl, and S. Iyer 1984 56 p refs
(NASA-CR-173265; NAS 1.26:173265) Avail: NTIS HC A04/MF A01 CSCL 20L

During the reporting period, InGaAs was grown on Fe-doped (semi-insulating) (100) InP substrates by current controlled liquid phase epitaxy (CCLPE) at 640 C and current densities of 2.5A sq/cm to 5 A/sq cm for periods from 5 to 30 minutes. Special efforts were made to reduce the background carrier concentration in the grown layers as much as possible. The best layers exhibited carrier concentrations in the mid-10 to the 15th power/cu cm range and up to 10,900 sq cm/V-sec room temperature mobility. InGaAsP quaternary layers of energy gap corresponding to wavelengths of approximately 1.5 microns and 1.3 microns were grown on (100) InP substrates by CCLPE. In the device fabrication area, work was directed toward processing MISFET's using InGaAs. SiO2, Si3N4 and Al2O3 were deposited by ion beam sputtering, electron beam evaporation and chemical vapor reaction on Si, GaAs, and InGaAs substrates. SiO2 and Si3N4 sputtered layers were found to possess a high density of pinhole defects that precluded capacitance-voltage analysis. Chemical vapor deposited Al2O3 layers on Si, GaAs and InGaAs substrates also exhibited a large number of pinhole defects. This prevented achieving good MIS devices over most of the substrate surface area. M.A.C.

N84-20402*# National Aeronautics and Space Administration, Washington, D. C.
SUBBARRIER ABSORPTION IN A STATIONARY SUPERLATTICE
G. M. Arutyunyan and Kh. V. Nerkararyan Jan. 1984 11 p refs Transl. into ENGLISH from Izv. Akad. Nauk Armyanskoy SSR, Fiz. (USSR), v. 15, no. 3, 1980 p 162-167 Transl. by Kanner (Leo) and Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77387; NAS 1.15:77387) Avail: NTIS HC A02/MF A01 CSCL 20L

The calculation of the interband absorption coefficient was carried out in the classical case, when the frequency of light was assumed to bind two miniband subbarrier states of different bands. The influence of two dimensional Mott excitons on this absorption was studied and a comparison was made with the experiment. All of these considerations were done taking into account the photon wave vector (the phase spatial heterogeneity). The basic traits of the energy spectra of superlattice semiconductors, their kinetic and optical properties, and possible means of electromagnetic wave intensification were examined. By the density matrix method, a theory of electrical and electromagnetic properties of superlattices was suggested. M.A.C.

N84-20403*# National Aeronautics and Space Administration, Washington, D. C.
THE PREPARATION OF BP SINGLE CRYSTALS BY HIGH PRESSURE FLUX METHOD
Yukinobu Kumashiro, Shunji Misawa, and Shunichi Gonda Jan. 1984 7 p refs Transl. into ENGLISH from Denki Kagaku Oyobi Kogyo Butsuri Kagaku (Japan), v. 51, no. 1, 1983 p 217-218 Transl. by Kanner (Leo) and Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77389; NAS 1.15:77389) Avail: NTIS HC A02/MF A01 CSCL 20B

Single crystals of BP, a III-V compound semiconductor, were obtained by the high pressure flux method. Cu3P and Ni12P5 powders were used as the flux, and mixed with BP powder. Two kinds of mixtures were prepared: (1) 1.8g (BP) + 35 G (Cu3P) and (2) 1.7 g (BP) + 25 g (Ni12P5). They were compressed into pellets, heated at 1300 C for 24 h in an induction furnace under a pressure of 1 MPa using Ar-P2 gas, and slowly cooled to room temperature. In case (1), BP single crystals grew along the (III) plane, and in case (2) they grew as an aggregate of crystallites. The cathodoluminescence spectra of the synthetic BP crystals showed peaks near 680 nm (1.82 eV) for case (1), and 500 nm (2.47 eV) for case (2). By using the high pressure flux method conventional sized crystals were obtained in a relatively short time. M.A.C.

N84-20404*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COAXIAL CARBON PLASMA GUN DEPOSITION OF AMORPHOUS CARBON FILMS
Daniel M. Sater (Cincinnati Univ.), Daniel A. Gulino, and Sharon K. Rutledge (Cleveland State Univ.) Mar. 1984 20 p refs
(NASA-TM-83600; E-2012; NAS 1.15:83600) Avail: NTIS HC A02/MF A01 CSCL 20L

A unique plasma gun employing coaxial carbon electrodes was used in an attempt to deposit thin films of amorphous diamond-like carbon. A number of different structural, compositional, and electrical characterization techniques were used to characterize these films. These included scanning electron microscopy, scanning transmission electron microscopy, X ray diffraction and absorption, spectrographic analysis, energy dispersive spectroscopy, and selected area electron diffraction. Optical absorption and electrical

resistivity measurements were also performed. The films were determined to be primarily amorphous, with poor adhesion to fused silica substrates. Many inclusions of particulates were found to be present as well. Analysis of these particulates revealed the presence of trace impurities, such as Fe and Cu, which were also found in the graphite electrode material. The electrodes were the source of these impurities. No evidence of diamond-like crystallite structure was found in any of the film samples. Details of the apparatus, experimental procedure, and film characteristics are presented. Author

N84-20405# Rockwell International Corp., Thousand Oaks, Calif. Science Center.

RESEARCH ON FERROELECTRIC MATERIALS FOR MILLIMETER WAVE APPLICATION Final Report, 5 Aug. 1981 - 4 Dec. 1982

R. R. Neurgaonkar, L. E. Cross, W. F. Hall, and W. W. Ho Aug. 1983 42 p

(Contract F49620-81-C-0090; DARPA Order 4240; AF Proj. 2306) (AD-A137128; SC5344.7FR; AFOSR-83-1299TR) Avail: NTIS HC A03/MF A01 CSCL 20/3

The largest and highest quality single crystals of the tungsten bronze family ferroelectric compositions of the strontium - barium niobate family reported to date were prepared by Czochralski growth techniques. Low frequency dielectric properties show low loss and high permittivity as expected. Accurate high frequency dielectric measurements for several compositions were made in a waveguide geometry from 30 to 100 GHz and the electric field sensitivity of the microwave refractive index, dn/dE, was evaluated by a modulation technique in the same waveguide geometry. Although high values of dn/dE were observed, an unexpectedly high dielectric loss, which does not fit accepted models for dielectric properties, was observed. This fact, coupled with a high sample-to-sample variability, suggests a commonly occurring extrinsic factor such as growth defects or sample impurities as the key element limiting the use of these materials for phase control applications in millimeter wave radar systems. Similar dielectric measurements were made on a variety of ceramic ferroelectrics. In general the losses were substantially higher in these materials. Author (GRA)

N84-20406# State Univ. of New York, Albany. Dept. of Physics.

PARTICLE SCATTERING STUDIES ON FOREIGN IONS IN SUPERIONIC CONDUCTORS

W. L. Roth, R. E. Benenson, C. Ji, L. Wielunski, and B. Dunn 21 Dec. 1983 26 p

(Contract N00014-82-C-0559)

(AD-A137231; TR-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

The effects of foreign ions on the structures and properties of superionic conductors are being investigated. This paper reports Rutherford backscattering, nuclear reaction analysis, and channeling studies on NaBeta-alumina crystals doped with Mn by ion implantation and with Li and Mg from melts. Implantation disorders the NaBeta-alumina surface. On heating, the surface crystallizes, and Mn diffuses into Al sites. The melt-doped compositions are accounted for by Mg substitution in the spinel layer and by Li in the conduction plane. Particle scattering has been used to profile sodium and impurities in NaBeta-alumina ceramics and F disorder in Beta-PbF2. GRA

N84-20407# Rockwell International Corp., Thousand Oaks, Calif. Science Center.

GROWTH OF HgCdTe BY MODIFIED MOLECULAR BEAM EPITAXY Final Report, 11 Feb. 1979 - 1 Mar. 1983

J. T. Cheung and H. Sankur Dec. 1983 75 p

(Contract MDA903-79-C-0188; DARPA Order 3704)

(AD-A137243; SC5202.23FR) Avail: NTIS HC A04/MF A01 CSCL 20/2

Laser assisted deposition was applied successfully to thin film growth of three materials: HgCdTe, CdTe and ZnO. For HgCdTe, congruent evaporation was induced by pulsed laser irradiation. Epitaxial Hg0.7Cd0.3Te layers up to 15 micrometers thick were grown on (111) CdTe substrates at 120 C in .0001 Torr of Hg backpressure from a single evaporation source. Materials were characterized structurally and electrically. The as-grown layers were n-type. After 410 C annealing, they were converted to p-type. n+/p implanted photodiodes were demonstrated. Very high quality (111) CdTe/(100) GaAs heteroepitaxy was demonstrated. The growth rate was as high as 12 micrometers/hr. The layers were characterized with X-ray, photoluminescence, UV reflectance and transmission electron microscopy and found to have very high crystalline quality. ZnO films were grown on a large variety of substrates using a pulsed CO2 laser. The substrate temperature were only 250 C, the films were highly oriented and uniform. They were also piezoelectric. Surface and acoustic wave transducers were demonstrated. Coupling coefficient superscript 2 was found to be 0.005. Author (GRA)

N84-20408# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.

THE EFFECTS OF SUBSTRATE SURFACE TREATMENTS ON THE DEFECT INCORPORATION IN HYDRIDE VPE GROWN InGaAs FILMS Final Report, 6 Jan. 1983 - 5 Jan. 1984

5 Jan. 1984 46 p

(Contract N00019-83-C-0034)

(AD-A137488) Avail: NTIS HC A03/MF A01 CSCL 20/12

The quality of the InP substrate surface was investigated, and it was shown that the substrate surface and the surface of the films grown on them is smoother when the substrate is etched in situ with an HCl etch than when it is bathed in PH3. The in situ etch also improves the mobility and decreases the background carrier concentration. Other surface studies show that a too large III/V ratio leads to hillock formation, and when the ratio is too small pits are formed. A current and capacitance DLTS system using both voltage and optical excitation of a Schottky barrier diode has been set up to study defects at the InGaAs/InP interface. The system has been tested out, and we currently are trying to identify the traps that have been observed. This work will be continued to its completion. A comprehensive study of the hydride growth on InP has been made. The growth rate was measured as a function of the input HCl, input PH3, and downstream HCl pressures, and the H2 flow rate. It was found that the growth rate initially increased with the input HC1 concentration and increased with the PH3 concentration as predicted by thermodynamics. GRA

N84-20409# Amorphous Materials, Inc., Garland, Tex.

LARGE PLATE CdTe SYNTHESIS BY SEALED VESSEL TRANSPORT Quarterly Technical Report, 1 Oct. - 31 Dec. 1983

G. R. Cronin Jan. 1984 44 p

(Contract MDA903-82-C-0159)

(AD-A137514; AD-E401120; AMI-014; QTR-8) Avail: NTIS HC A03/MF A01 CSCL 20/2

The eighth quarterly technical report for the program to grow large plates of high purity CdTe in a sealed system covers the period Oct. 1-Dec. 31, 1983. A process to grow up to 10 inch diameter plates of high purity CdTe with large grain size has been developed. Evaluation results have confirmed the purity and high resistivity of the resultant materials. During this reporting period plates were grown from near stoichiometric melt compositions up to one inch in thickness. Heat treatment experiments on thick samples under cadmium and tellurium overpressure were carried out. The sawing procedure for cutting oriented substrates was improved by the acquisition of a goniometer for crystal mounting and adapting the orienting laser directly to the wire saw base platform, Also during this reporting period the first experiments in liquid phase epitaxy of HgCdTe were carried out in a modified rotating quartz boat using (111) oriented substrates. Author (GRA)

N84-20410# California Univ., Santa Barbara. Dept. of Physics.

AN ELECTROMAGNETIC SQUEEZER FOR COMPRESSING SQUEEZABLE ELECTRON TUNNELING JUNCTIONS

John Moreland and P. K. Hansma Jan. 1984 23 p Submitted for publication

(Contract N00014-78-C-0011; NR Proj. 056-6731)

(AD-A136668; TR-16) Avail: NTIS HC A02/MF A01 CSCL 20/12

The resistance of squeezable electron tunnel junctions (SET junctions) can be adjusted with an electromagnetic squeezer. For junctions immersed in liquid helium, the resistance is stable to approximately 0.1%. This stability is sufficient for measurements of superconducting energy gaps and for superconducting phonon spectroscopy out to 50 mV applied bias. Increased stability, especially at higher biases, will be necessary for inelastic electron tunneling spectroscopy. GRA

N84-20411# Westinghouse Research and Development Center, Pittsburgh, Pa.
THIN FILM TECHNOLOGY OF HIGH-CRITICAL-TEMPERATURE SUPERCONDUCTING ELECTRONICS Annual Report, 1 Aug. 1982 - 30 Oct. 1983
J. Talvacchio, A. I. Braginski, J. R. Gavaler, M. A. Janocko, A. S. Manocha, and R. D. Blaugher 5 Dec. 1983 74 p
(Contract N00014-82-C-0617)
(AD-A136722; Rept-83-9C9-TUDEV-R1) Avail: NTIS HC A04/MF A01 CSCL 20/12

The objective of the first year's work was to investigate A15 superconductor/barrier oxide interfaces, identify oxide depth profiles, and determine resulting tunneling characteristics using soft tunnel junction counterelectrodes. Bilayers consisting of Nb and vanadium-silicon (A15) base electrodes and thin Y, Al, and Si barriers have been deposited in-situ and oxidized in humid air for up to three days. XPS analysis was used to compare the barrier coverage, uniformity, oxidation, and ability to protect the base electrode from oxidation for three deposition techniques: dc magnetron sputtering, dc diode sputtering, and reactive diode sputtering followed by pyrolysis. Y and Al have been found to be fully oxidized due to long oxidation times. In the above conditions the overlayers did not protect the superconductors from oxidation/hydration, and the surface of oxidized vanadium-silicon was also degraded by atomic segregation. The tunneling I-V characteristics exhibited very high leakage currents also suggestive of incomplete superconductor coverage by the metallic overlayer. GRA

N84-20412# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
GROWTH OF CADMIUM TELLURIDE BY PULLING UNDER LIQUID ENCAPSULATION Final Technical Report, 1 Aug. 1982 - 30 Jun. 1983
August F. Witt Dec. 1983 17 p
(Contracts N00014-82-K-2050; DAAG29-82-K-0119)
(AD-A136842) Avail: NTIS HC A02/MF A01 CSCL 20/12

This research effort was aimed at re-examining the potential of the LEC technique for growth of CdTe. The study was conducted in two ADL systems, type MP and MP-II, suitable for growth at pressures up to 75 and 600 psi respectively. Investigations of the optical and thermal properties of B2O3 were carried out in a modified conventional low pressure puller. This study established the suitability of the LEC technique for growth of CdTe in single crystal form. GRA

N84-20413# Honeywell Corporate Technology Center, Bloomingdale, Minn.
GAAS GIGABIT MONOLITHIC OPTOELECTRONIC TRANSMITTER Final Report, Jul. 1981 - Aug. 1983
J. K. Carney Oct. 1983 79 p
(Contract N00014-81-C-2256)
(AD-A136894; AD-E001642) Avail: NTIS HC A05/MF A01 CSCL 20/12

The objective of this program was to develop the Technologies required to monolithically integrate a high performance AlGaAs laser diode with high speed digital GaAs circuitry. This objective was met with the demonstration of a fully integrated optoelectronic transmitter consisting of a Transverse junction stripe (TJS) laser diode, a power driver transistor, and a 4:1 multiplexer. This demonstration is the first major step in the development of high speed optical interconnects for future digital systems operating a gigabit second data rates. GRA

N84-20414# State Univ. of New York, Stony Brook. Dept. of Materials Science and Engineering.
BACKGROUND RESEARCH IN SUPPORT OF THE NEW GRANT PROPOSAL: RESEARCH CONSORTIUM FOR X-RAY TOPOGRAPHY ON LINE X-19 AT NSLS
J. C. Bilello 1 Nov. 1983 13 p refs
(Contract DE-AC02-80ER-10740)
(DE84-004212; DOE/ER-10740/12) Avail: NTIS HC A02/MF A01

The status of the construction and installation of components of the synchrotron topography station is reported as well as progress in the development of hardware for interfacing and software for interactively controlling the 13 motors which automate the facility. Research focuses on the problem of X-ray optics and on techniques for applying topography to materials science. There is colaboration with other researchers in studying the nature of brittle fracture of refractory metals and in interpreting contact in the vicinity of crack tips. A.R.H.

N84-20415# Northeastern Univ., Boston, Mass.
DYNAMICAL FRICTION IN CONDENSED MATTER Progress Report, 15 Apr. - 15 Dec. 1983
J. B. Sokoloff and C. H. Perry Dec. 1983 32 p refs
(Contract DE-AC02-81ER-10866)
(DE84-004202; DOE/ER-10866/3) Avail: NTIS HC A03/MF A01

The problem of nonlinear electrical conductivity due to motion of charge density waves in crystal under an applied field is a microscopic model system exhibiting friction-like phenomena. Two unexplained experimental results in this system are the occurrence of narrow band noise for dc electric field above the threshold for charge density wave sliding and the observed occurrence of metastability in the charge density wave contribution to the electrical conduction. Studies are described on IR and Raman spectroscopy of high temperature phase transitions in non-stoichiometric zirconia-yttria mixed crystals, inelastic and diffuse elastic neutron scattering of cubic zirconia, infrared and Raman spectra of potassium hollandite, and Raman investigations of graphite intercalated with AsF5 and SbC15. DOE

N84-20416# Massachusetts Inst. of Tech., Cambridge.
STRUCTURAL UNIT/GRAIN BOUNDARY DISLOCATION MODEL FOR GRAIN BOUNDARY STRUCTURE
R. W. Balluffi and P. D. Bristowe Dec. 1983 35 p refs
(Contract DE-AC02-78ER-05002)
(DE84-003167; DOE/ER-05002/37) Avail: NTIS HC A03/M A01

The applicability of the structural unit/grain boundary dislocation (GBD) model to recently calculated core structures of a number of series of boundaries is considered. The following questions are posed: (1) Is there a best choice of structural units? (2) Can the distortions of these units be understood in a systematic way? (3) Are the distortions of the units of a given type sufficiently small to justify the model? Questions (1) and (2) are discussed in detail and answered affirmatively. The answer to Question (3) is qualified. Relaxations occur in all boundaries tested which tend to improve the uniformity of the units, localize the corresponding GBDs and, hence, increase the applicability of the model. The model therefore stands as the most physically viable model for representing the systmatics of the computed core structures. However, in some cases, these relaxations are relatively weak, the units exhibit significant systematic distortions, and the corresponding GBDs are partially delocalized. In such cases the model must be considered an approximation, particularly for many quantitative purposes. DOE

N84-20417# Virginia Univ., Charlottesville. Dept. of Physics.
SPECTROSCOPY OF SURFACE ADSORBED MOLECULES Progress Report, 1 May 1983 - 30 Apr. 1984
R. V. Coleman 1984 8 p refs
(Contract DE-AS05-78ER-05776)
(DE84-005254; DOE/ER-05776/12) Avail: NTIS HC A02/MF A01

Progrress is reported on the understanding and control of the barrier properties for applications to inelastic electron tunneling

spectroscopy. A correlation of the barrier behavior with molecular reactivity and pi-delocalization has led to an initial understanding of the large barrier perturbations introduced by some dopant molecules. DOE

N84-20418# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ELASTIC THEORY OF THE DEFECT SOLID SOLUTION
J. W. Morris, Jr., A. G. Khatchatryan (Academy of Sciences (USSR), Moscow), and S. H. Wen (IBM Watson Research Center, Yorktown Heights, N.Y.) Jun. 1983 31 p refs Presented at NATO Advan. Study Inst. on Modulated Struct. Material., Crete, Greece, 15 Jun. 1983
(Contract DE-AC03-76SF-00098)
(DE84-001976; LBL-16551; CONF-8306163-1) Avail: NTIS HC A03/MF A01

The linear elastic theory of the defect solid solution is reviewed. The development of the theory is outlined into the mathematical form that is most suitable for the solution of practical problems. The theory treats solid solutions containing distributions of solute defects that distort the solvent lattice and interact elastically with one another. The total strain of the solvent lattice and the elastic contribution to the free energy of the solution in the strong harmonic approximation are determined. The theory is specifically developed for a binary solution of point defects in the absence of external stress. Multicomponent solutions, stressed solutions, and solutions of finite defects or macroscopic inclusion are treated. The equations governing these complex systems are also presented. The model is finally used to consider ordering and decomposition reactions in solutions whose components interact elastically. DOE

N84-20419# Technische Hochschule, Aachen (West Germany). Inst. fuer Theoretische Elektrotechnik.
INTEGRATED FILTERS IN MOS TECHNOLOGY Final Report, Jun. 1982
Hans-Walter Klein and Reinhard Brock Bonn Bundesministerium fuer Forschung und Technologie Sep. 1983 86 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-194; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18

Pulse code modulation low pass filters in a switched capacitor design were constructed. A low pass filter of the 4th order and a couple of operational amplifiers were made. An Al-CMOS-process was extended by a second metallization layer. An Si-gate CMOS-process using local oxidation was developed. Double-polysilicon capacitors with thermal polysiliconoxide as dielectric and compatible with the Si-gate CMOS process were produced.
Author (ESA)

N84-20420# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
A METHOD FOR SOLVING BOLTZMANN'S EQUATION IN SEMICONDUCTORS BY EXPANSION IN LEGENDRE POLYNOMIALS
Th. G. vanderRoer and S. C. vanSomerenGreve Jan. 1983 25 p refs
(EUT-83-E-134; ISBN-90-6144-134-X; ISSN-0167-9708) Avail: NTIS HC A02/MF A01

A method to calculate the transport of carriers in a semiconductor is described. It relies on an iterative solution of Boltzmann's equation, in which an assumed distribution function (DF) in k-space is substituted into the part that describes scattering. The resulting differential equation is solved, giving a new approximation for the DF. The angular dependence of the DF is expanded into a series of Legendre polynomials. This expansion is substituted into Boltzmann's equation, leading to an infinite set of equations which may be truncated after a certain number, depending on the desired accuracy. It is found that by adding fictitious scatterings which do not alter the DF, so that the total scattering rate becomes independent of k, the solution of the set of differential equations can be found in the form of integrals which are easy to evaluate numerically. Author (ESA)

N84-19840# Technical Univ. of Istanbul (Turkey).
DYNAMIC APPLICATIONS OF PIEZOELECTRIC CRYSTALS. PART 3: EXPERIMENTAL STUDIES
M. C. Doekmeci *In* the Shock and Vibration Digest, Vol. 15, No. 5 May 1983 p 11-22 refs (For primary document see N84-19838 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/2

N84-19891# National Research Inst., Bankura (India).
ON THE FACE-SHEAR VIBRATIONS OF CONTOURED CRYSTAL PLATES
Sasadhar De *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 2 May 1983 p 139-149 refs (For primary document see N84-19881 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/2

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N84-20421# Range Commanders Council, White Sands Missile Range, N. Mex. Meteorology Group.
BARKING SANDS, HAWAII. RANGE REFERENCE ATMOSPHERE 0-70 km ALTITUDE
Dec. 1983 204 p Supersedes IRIG-104-63-PT-1-LKH, AD-782653
(AD-A137406; RCC/MG-370-83; IRIG-104-63-PT-1-LKH) Avail: NTIS HC A10/MF A01 CSCL 04/2

The RRA contains tabulations for monthly and annual means, standard deviations, and skewness coefficients for windspeed, pressure, temperature, density, water vapor pressure, virtual temperature, and dewpoint temperature; the means and standard deviations for the zonal (U) and meridional (V) wind components; and the linear (product moment) correlation coefficient between the wind components. These statistical parameters are tabulated at the station elevation, at 1-km intervals from sea level to 30 km, and at 2-km intervals from 30 to 90 km. The wind statistics are given at approximately 10 m above the station elevations and at altitudes with respect to mean sea level thereafter. For those range sites without rocketsonde measurements, the RRAs terminate at 30 km altitude, or they are extended, if required, when rocketsonde data from a nearby launch site are available. There are four sets of tables for each of the 12 monthly reference periods and the annual reference period. GRA

N84-20422# Virginia Polytechnic Inst. and State Univ., Blacksburg.
APPLIED MATHEMATICS OF TRANSPORT THEORY Progress Report, Sep. 1982 - Nov. 1983
William Greenberg and Paul F. Zweifel Nov. 1983 18 p refs
(Contract DE-AS05-80ER-10711)
(DE84-004135; DOE/ER-10711/2) Avail: NTIS HC A02/MF A01

Progress in several continuing areas of mathematics research is outlined under the following general subheadings: (1) abstract transport theory; (2) explicit models and numerical/computational analysis; (3) gas dynamics; and (4) Miscellaneous. Results obtained are reported on in journal and in national and international technical conferences. A bibliography is included. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-20423# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AN INVENTORY PLANNING SYSTEM [UN SISTEMA DE PLANEJAMENTO AGREGADO DE ESTOQUES]
Jose Luiz Contador and Horacio Hideki Yanasse Jun. 1983 64 p refs Presented at the 16th Brazilian Operations Res. Symp., Florianopolis, Brazil, Oct. 1983
(INPE-2766-PRE/339) Avail: NTIS HC A04/MF A01

The inventory planning problem of repair items needed for the maintenance program of a transportation fleet is considered. Due to the capital budget restrictions it is mandatory to consider all items together in an optimization model, rather than optimize the inventory of each item independently. It is required that replenishments be made in submultiple periods of twelve (i.e., 1, 2, 3, 4, 6, 12) so that an administrative simplification is achieved. An integer programming model taking into consideration such constraints would have a great number of integer variables, presenting, therefore, serious difficulties in achieving solutions. With the use of aggregate production planning models, these difficulties can be partially eliminated with the reduction of the number of integer variables. In these models, items are aggregated according to some criteria. Two aggregation criteria are presented. In the first, stock items are aggregated according to the maintenance services that are performed. S.L.

N84-20424# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
KNOWLEDGE-BASED SUPPORT SYSTEMS FOR LONG RANGE PLANNING Interim Report
Donald W. Kosy and Vasant Dhar Dec. 1983 45 p
(AD-A137311; CMU-RI-TR-83-21) Avail: NTIS HC A03/MF A01 CSCL 05/1

Long range planning is the process by which an organization assesses its future environment and develops specific plans of action to respond to, or change, that environment to achieve its goals. This report presents the results of a study of long range planning practices at one plant of a large U.S. computer firm, focusing on current and potential decision support systems (DDSs) for the quantitative aspects of the planning process. While it appears that the clerical tasks in the process can be computerized using current DDS technology, this technology does not help managers evaluate the credibility or quality of the plans made. An architecture is described for a system incorporating a much richer store of knowledge about planning variables which would allow the system itself to validate, explain, and justify its results. A concrete realization of such a system, called ROME, has been designed and is currently under development. Design goals for ROME are presented and potential uses of the system are illustrated. Author (GRA)

N84-20425# Meridian Corp., Falls Church, Va.
REQUIREMENTS ANALYSIS FOR FORWARD FUNDING TRACKING SYSTEM, VOLUME 1 Final Report
1 Dec. 1983 49 p
(Contract MDA903-83-C-0342)
(AD-A136840) Avail: NTIS HC A03/MF A01 CSCL 05/1

Volume I of this report focuses on the efforts undertaken with respect to the requirements for a Forward Funding Tracking System. The purpose of this effort was to analyze the feasibility and cost effectiveness of developing a forward funding tracking system which was capable of utilizing existing DARPA data bases. Used in this context, forward funding tracking refers to the process by which DARPA commits, obligates, and ultimately manages its fiscal resources. The motivation behind this analysis was the need to provide the DARPA Program Management Office (PMO) with sufficient information to enable an informed decision regarding the effectiveness of potential approaches to financial management. This need is a principal concern to the PMO, since it is the responsibility of this office to plan, manage, and control, at the aggregate level, DARPA program funds and project scheduling. In addition, within the context of the overall DARPA mission to pursue high-risk, high-payoff R&D, it is incumbent upon the technical program offices to manage individual projects from a technical, cost, and schedule point of view. Consequently, the coordination of the resource requirements for management of these individual projects is also a primary concern to the PMO. GRA

N84-20426# Meridian Corp., Falls Church, Va.
REQUIREMENTS ANALYSIS FOR MILESTONE TRACKING SYSTEM, VOLUME 2 Final Report
1 Dec. 1983 17 p
(Contract MDA903-83-C-0342)
(AD-A136841) Avail: NTIS HC A02/MF A01 CSCL 05/2

Volume II of this report concerns the efforts undertaken with respect to a Milestone Tracking System. The purpose of this task was to analyze the feasibility and cost effectiveness of developing milestone tracking system for internal use within DARPA which was capable of utilizing existing DARPA data bases. As defined in this document, milestones include a wide range of internal and external developments as well as decision points which may be of interest to DARPA managers. Specifically, these include: Technical achievements; Technical decision points; Financial decision points; Point of inter-project dependencies; and External events/considerations. The purposes initially identified for a milestone tracking system were threefold. First, the system was envisioned to be a mechanism to provide program managers with a concise representation of their program activities. Second, the system was conceived to provide an automatic prompting of milestone and/or critical events identified by the user. Third, the system was viewed as a mechanism to retain an historical data base on the conduct of DARPA programs. It soon became evident that the system also had utility in providing input to programming decisions through the analysis of imbedded dependency networks. GRA

N84-20427# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
ON THE FACIAL STRUCTURE OF SCHEDULING POLYHEDRA
Egon Balas Aug. 1983 56 p
(Contract N00014-82-K-0329; Grant NSF ECS-82-05425; NR Proj. 047-607)
(AD-A136983; MSRR-496; WP-16-83-84) Avail: NTIS HC A04/MF A01 CSCL 12/1

A well-known job shop scheduling problem can be formulated as follows. Given a graph G with node set N and with directed and undirected arcs, find an orientation of the undirected arcs that minimizes the length of a longest path in G. The author treats the problem as a disjunctive program, without recourse to integer variables, and give a partial characterization of the scheduling polyhedron P(N), i.e., the convex hull of feasible schedules. In particular, he derives all the facet inducing inequalities for the scheduling polyhedron P(K) defined on some clique with node set K, and give a sufficient condition for such inequalities to also induce facets of P(N). One of our results is that any inequality that induces a facet of P(H) for some H properly included in K, also induces a facet of P(K). Another one is a recursive formula for deriving a facet inducing inequality with p positive coefficients from one with p-1 positive coefficients. The author also addresses the constraint identification problem, and gives a procedure for finding an inequality that cuts off a given solution to a subset of the constraints. Author (GRA)

N84-20428# BioTechnology, Inc., Falls Church, Va.
AN INTRODUCTION TO HUMAN FACTORS FOR ENGINEERING MANAGERS: FRAMEWORK FOR A TEACHING UNIT Final Research Note
H. E. Price, J. S. Kidd, and C. R. Sawyer Dec. 1983 139 p
(Contract MDA903-81-C-0541; DA Proj. 2Q1-62722-A-791)
(AD-A135958; ARI-RN-83-50) Avail: NTIS HC A07/MF A01 CSCL 05/9

The materials provided in this document represent an attempt to capture and convey in a concise way some of the basic characteristics of human factors work that managers of military system development projects need to know so that such managers can do their jobs more effectively. A framework is presented that can be used in the planning and presentation of a short course or workshop, or that can be used as a unit in a sustained program of instruction. GRA

N84-20429# Arbeitsgemeinschaft der Grossforschungseinrichtung, Bonn (West Germany).
DOCUMENTS ON INDUSTRIAL RESEARCH [DOKUMENTE ZUR GROSSFORSCHUNG]
Eberhard Gockel, ed. Apr. 1983 56 p refs In GERMAN
(AGF-Dok-1/1983; ISSN-0724-309X) Avail: NTIS HC A04/MF A01

The history of the West German Committee of Industrial Research Institutes; industrial research establishments; industrial research and the state; industrial research facilities; relations between industrial research institutes and industry; and cooperation between universities and industrial research institutes are discussed. Author (ESA)

N84-20430# Arbeitsgemeinschaft der Grossforschungseinrichtung, Bonn (West Germany).
INDUSTRIAL RESEARCH AND INDUSTRY: FORMS OF COLLABORATION AND PARTICIPATION [GROSSFORSCHUNG UND INDUSTRIE: FORMEN DER ZUSAMMENARBEIT UND BETEILIGTE PARTNER]
Eberhard Gockel, ed. Apr. 1983 43 p In GERMAN
(AGF-Dok-2/1983; ISSN-0724-309X) Avail: NTIS HC A03/MF A01

Tasks and aims of industrial research, and cooperation with industry are discussed. Author (ESA)

N84-20431# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
REPORT ON AN INFORMATION TRIP TO HOLLAND, AUGUST - SEPTEMBER 1983
Erland Svensson and Maud Thanderz Nov. 1983 21 p refs Partly in ENGLISH and SWEDISH Proc. of 9th Res. Conf. on Subjective Probability, Utility and Decision Making (SPUDM), Groningen, Neth., 29 Aug. - 2 Sept. 1983
(FOA-C-59006-H2; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

Models of how people should make decisions and the way they make decisions in reality are cited. Computurized decision aids are mentioned. Author (ESA)

N84-19866# Shock and Vibration Information Center (Defense), Washington, D. C.
TECHNICAL INFORMATION SUPPORT FOR SURVIVABILITY
H. C. Pusey, R. H. Volin, and J. G. Showalter *In its* The Shock and Vibration Bull., Part 1 May 1983 21-31 (For primary document see N84-19866 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 05/1

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-20432* National Aeronautics and Space Administration, Washington, D. C.
NASA PATENT ABSTRACTS BIBLIOGRAPHY. SECTION 1: ABSTRACTS
Jan. 1984 69 p
(NASA-SP-7039(24)-Sect-1; NAS 1.21:7039(24)-Sect-1) Avail: NTIS HC $10.00 CSCL 05B

Abstracts are provided for 167 patents and patent applications entered into the NASA scientific and technical information system during the period July 1983 through December 1983. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. A.R.H.

N84-20433* National Aeronautics and Space Administration, Washington, D. C.
PATENT ABSTRACTS BIBLIOGRAPHY, A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES
Jan. 1984 364 p
(NASA-SP-7039(24)-Sect-2; NAS 1.21:7039(24)-Sect-2) Avail: NTIS HC $20.00 CSCL 05B

A subject index is provided for over 4300 patents and applications for patent for the period from May 1969 through December 1983. Additional indexes list personal authors, corporate authors, contract numbers, NASA case numbers, U.S. patent class numbers, U.S. patent numbers, and NASA assession numbers, A.R.H.

N84-20434*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESEARCH AND TECHNOLOGY, FISCAL YEAR 1983 Annual Report
1983 101 p
(NASA-TM-85557; NAS 1.15:85557) Avail: NTIS HC A06/MF A01

The responibilities and programs of the Goddard Space Flight Center are ranged from basic research in the space and Earth sciences through the management of numerous flight projects to operational responsibility for the tracking of and data acquisition from NASA's Earth orbiting satellites, Progress in the areas of spacecraft technology, sensor development and data system development, as well as in the basic and applied to research in the space and Earth sciences that they support is highlighted. A.R.H.

N84-20435*# Engineering and Economics Research, Inc., Vienna, Va. Data and Operations Subcommittee.
STARLAB GROUND SYSTEM GUIDELINES DOCUMENT Final Report
Frederick J. Hawkins Jan. 1984 132 p refs Sponsored in part by National Research Council of Canada and Australian Department of Science and Technology
(Contract NAS5-27617)
(NASA-CR-175192; NAS 1.26:175192) Avail: NTIS HC A07/MF A01 CSCL 05B

Starlab science objectives, ground system considerations, space shuttle sortie, space platform/station, mission planning, and remote facilities are addressed. N.W.

N84-20436# Stanford Univ., Calif. Dept. of Operations Research.
SIMULATION METHODOLOGY Final Report, 1 Jan. 1976 - 30 Sep. 1983
Donald L. Iglehart Dec. 1983 7 p
(Contract N00014-76-C-0578; NR Proj. 042-343)

(AD-A137127) Avail: NTIS HC A02/MF A01 CSCL 05/2

This bibliography lists thirty-one technical reports. The principal topics covered in this research were condition limit theorems for Markov chains, variance reduction techniques for Markov chains, simulation of response times in networks of queues, simulation of generalized semi-Markov processes and general state space Markov chains, asymptotic theory for nonparametric confidence intervals, and autoregressive method for simulation output analysis, simulation of non-Markovian systems, and simulation output analysis for local area computer networks. Toward the end of this period research began on the development of algorithms to optimize systems parameters for simulation. An approach using smoothing splines has been developed. GRA

N84-20437# Naval Postgraduate School, Monterey, Calif.
BENCHMARKING RELATIONAL DATABASE MACHINES' CAPABILITIES IN SUPPORTING THE DATABASE ADMINISTRATORS' FUNCTIONS AND RESPONSIBILITIES M.S. Thesis
Curtis M. Ryder Sep. 1983 92 p
(AD-A137413) Avail: NTIS HC A05/MF A01 CSCL 05/2

This thesis describes the functions of the Database Administrator (DBA) and how they are supported by the benchmarked relational database machine. An examination of the relational query language provided, DBA support services required, the performance issues involved, and the security features employed is presented. The goal of this work is to develop general guidelines for DBA to follow in implementing and operating an effective, responsive database system. Author (GRA)

N84-20438# Naval Postgraduate School, Monterey, Calif.
BENCHMARKING THE SELECTION AND PROJECTION OPERATIONS AND ORDERING CAPABILITIES OF RELATIONAL DATABASE MACHINES M.S. Thesis
R. A. Bogdanowicz Sep. 1983 68 p
(AD-A136776) Avail: NTIS HC A04/MF A01 CSCL 09/2

This thesis describes the performance-measurement experiments designed for a number of back-end, relational database machine configurations. An in-depth study of the tests and results of the two relational operations, namely, selection and projection, on a specific configuration is presented. In addition, tests are made on the ordering capabilities and performance of the machine configuration. The goal of the work is to lead to a development for a machine-independent methodology for benchmarking the selection and projection operations and on ordering capabilities of database machines. Author (GRA)

N84-20439# Army War Coll., Carlisle Barracks, Pa.
CLASSIFIED DOCUMENT HANDBOOK
1 Oct. 1983 20 p
(AD-A137002) Avail: NTIS HC A02/MF A01 CSCL 15/3

This Classified Document Handbook is applicable to all US Army War College components, and replaces the Classified Guidance Handbook, dated 1 March 1980. This information has been extracted from several regulations and directives. While fairly detailed, it does not illustrate every conceivable situation that may be encountered in the preparation of a classified document. GRA

N84-20440# Oak Ridge National Lab., Tenn.
ALGORITHM TO CALCULATE PROPORTIONAL AREA TRANSFORMATION FACTORS FOR DIGITAL GEOGRAPHIC DATABASES
R. Edwards 1983 11 p refs Presented at Spatially-Oriented Referencing Systems Assoc. (SORSA) Gen. Meeting, College Park, Md., 10 Oct. 1983
(Contract W-7405-eng-26)
(DE84-004456; CONF-8310244-1) Avail: NTIS HC A02/MF A01

A computer technique to determine proportionate area factors used to transform thematic data between large geographic areal data bases is described. The number of calculations in the algorithm increases linearly with the number of segments in the polygonal definitions of the data bases, and increases with the square root of the total number of chains. The calculation transformation factors for two national data bases, the USGS Water Cataloging Unit outlines and DOT county boundaries which consist of 2100 and 3100 polygons respectively is presented. The technique facilitates using thematic data defined on various natural bases in analyses which involve economic and other administrative bases and vice versa. DOE

N84-20441# Oak Ridge National Lab., Tenn. Composition Unit.
TYPOGRAPHICAL TERMINOLOGY
T. R. Walker 1983 4 p Presented at the IEEE Profess. Commun. Soc. Conf., Atlanta, 19 Oct. 1983
(Contract W-7405-eng-26)
(DE84-001981; CONF-8310243-1) Avail: NTIS HC A02/MF A01

Printers and compositors use high speed, computerized phototypesetters instead of type cases and Linotype machines but many of the words they use were developed during the early days of printing when all type was set by hand from a typecase. Although the words, as used today, still have the same basic meaning, the editor or writer has no way of knowing the meaning unless they have a background in printing or typesetting. The most commonly used words and their origins and definitions are listed. The inability to communicate with printers and typesetters frequently leads to misunderstandings and the production of work that does not meet the required standards. DOE

N84-20442# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
SECURITY, A SET OF RULES OR AN APPROACH
R. P. DeMoel 27 Sep. 1982 16 p refs In DUTCH; ENGLISH summary Presented at Cryptography Course, Amsterdam, 4-8 Oct. 1982
(NLR-MP-82047-U) Avail: NTIS HC A02/MF A01

Computer information security measures are examined. Encryption of data as a protection against unauthorized examination is discussed. Protective mechanics, general security directives derived from conventional security, and management security considerations are reviewed. Author (ESA)

N84-20443 Case Western Reserve Univ., Cleveland, Ohio.
A METHOD FOR COMPARING THE STRUCTURE OF A DISCIPLINE TO THE STRUCTURE OF A BIBLIOGRAPHIC FILE FOR THAT DISCIPLINE Ph.D. Thesis
Judith Barlow Wood 1983 88 p
Avail: Univ. Microfilms Order No. DA8328270

The less than optimum satisfaction with present information and bibliographic files and their associated retrieval systems suggests that the structure of these files may not closely reflect the structure of the disciplines those files represent. This study presents a method for objectively and quantitatively examining and comparing structures of disciplines with structures of the bibliographic or information files of those disciplines. It tests the hypothesis that present file structures are not highly correlated with the structures of the day-to-day operational world dealt with by the end users of those files. A structure is derived for the discipline of tropical medicine based on the signs and symptoms of tropical diseases. The National Library of Medicine's MEDLINE file is examined for a corresponding structure, based on the use of the same signs and symptoms as index terms for articles on the tropical diseases. For the discipline, the structure consists of intercommunication classes resulting from the relationships between the signs and symptoms in the diseases. Dissert. Abstr.

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N84-20444# Naval Postgraduate School, Monterey, Calif.
STATISTICAL MODELS FOR ESTIMATING OVERHEAD COSTS
Dan C. Boger Oct. 1983 45 p
(F60-433)
(AD-A137351; NPS54-83-014) Avail: NTIS HC A03/MF A01 CSCL 12/1

Five years of quarterly overhead costs at two major defense

aircraft manufacturers were categorized according to the types of costs incurred. These categories of overhead costs were then modeled via regression analysis using production and operating data from the two contractors as independent variables. Adjustment for quarterly autocorrelation revealed excellent structural and predictive models of total overhead and labor-related overhead costs. Author (GRA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-20445# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
HYBRID VEHICLE SIMULATION M.S. Thesis
D. B. Founds 17 Oct. 1983 74 p
(AD-A136950; AD-E001638; AFIT/GAE/AA/81D-8) Avail: NTIS HC A04/MF A01 CSCL 13/6

Interest in nonpetroleum fueled ground vehicles led Stafford to develop the computer code, Electric Vehicle Simulation (EVSIM). EVSIM was designed to predict the performance of current electric vehicles or to be used in the design of electric/hybrid vehicles. Before EVSIM could be used, it needed to be verified by comparing its predictions to the results of a vehicle test. It was also desired to improve the code's ability to model several types of Internal Combustion Engines that may be used in hybrid vehicles. The approach taken was to test the components of the hybrid vehicle separately prior to testing the whole vehicle. This was done to verify separate sections of EVSIM prior to a systems run. The results of these comparisons and the system comparison are included with recommended changes to EVSIM. GRA

N84-19897# Martin Marietta Aerospace, Denver, Colo.
BRAKING-TURNING-MANEUVERING STABILITY OF HEAVY TRANSPORTERS
Phineas Woods *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., part 3 May 1983 p 51-61 refs (For primary document see N84-19893 10-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 13/6

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-20446# Royal Observatory, Edinburgh (Scotland).
ROYAL OBSERVATORY, EDINBURGH: RESEARCH AND FACILITIES 1983
1983 90 p refs Original contains color illustrations
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A report on the Edinburgh observatory and its research facilities is presented. Research highlights include: cosmology; quasars a d galaxies with active nuclei; normal galaxies; and the life cycle of stars. For individual titles, see N84-20447 through N84-20450.

N84-20447# Royal Observatory, Edinburgh (Scotland).
COSMOLOGY
In its Roy. Obs., Edinburgh: Res. and Facilities 1983 1983 p 1-8 refs (For primary document see N84-20446 10-89)
Avail: Issuing Activity

The method to study cosmological evolution which is similar to the technique for obtaining the structure of the Earth is outlined. It includes: galaxy, make a survey of the chosen class of object down to some level of observed flux density and find the distance to each object. This will show the distribution of intrinsic luminosities and the variation of this with distance. The problems with this approach vary with the waveband of the survey. Techniques to select quasars automatically from UK Schmidt prism plates scanned by COSMOS are developed, however, the most fruitful waveband at present is the radio. To obtain distances the optical object associated with the radio emission has to be found and its redshift measured. The position coincidence search technique may be used to find quasars, but in many cases the identification is with a galaxy; galaxies are much fainter optically and so measuring redshifts becomes difficult. E.A.K.

N84-20448# Royal Observatory, Edinburgh (Scotland).
QUASARS AND GALAXIES WITH ACTIVE NUCLEI
In its Roy. Obs., Edinburgh: Res. and Facilities 1983 1983 p 9-14 refs (For primary document see N84-20446 10-89)
Avail: Issuing Activity

A program to monitor the flux and polarization variations of BL Lac objects which has so far obtained data on 31 objects is outlined. The majority of fluxes were observed at several wavelengths and sampled at several time intervals. The observations achieved two major goals: (1) they established several important statistical properties of the objects, the most luminous sources appear to exceed the classical Eddington limit, the range of polarization position angles observed in an object correlates well with its luminosity, the maximum polarization and maximum spectral index are correlated; (2) in each of the most successful observing periods, one of the objects was in a state of outburst, and has produced flux and polarization changes. It is indicated that most of the flux comes from a small region with highly organized geometry and massive energy losses. Author

N84-20449# Royal Observatory, Edinburgh (Scotland).
NORMAL GALAXIES
In its Roy. Obs., Edinburgh: Res. and Facilities 1983 1983 p 15-26 ref (For primary document see N84-20446 10-89)
Avail: Issuing Activity

A picture of typical Galactic sites of massive star formation has emerged from radio continuum, molecular line and infrared observations. Star formation occurs in massive molecular clouds. Large, well formed, optically visible HII regions reside near the cloud edge. Deeper in the cloud the compact HII regions are found which are often accompanied by maser emission. It is shown that these objects represent a very early stage in the life of an OB star. It is found that there is an apparently younger population of objects deep within the molecular cloud the so-called protostars typified by the Becklin-Neugebauer object in Orion. E.A.K.

N84-20450# Royal Observatory, Edinburgh (Scotland).
THE LIFE CYCLE OF STARS
In its Roy. Obs., Edinburgh: Res. and Facilities 1983 1983 p 19-26 ref (For primary document see N84-20446 10-89)
Avail: Issuing Activity

The nuclear sources of stellar energy and other physical processes that govern the initial structure of a star are outlined. Models which describe the evolution with time of the temperature, luminosity agree with measurements. To observe the very early and late stages of a star's life, when gravitation is the dominant force, is not a straightforward task and requires a wide range of observing frequencies. The process underlying star birth and star death are not well understood, and observation of these stages in the stellar life cycle is emphasized. E.A.K.

N84-20451# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
EXTRAGALACTIC RADIO SOURCES: RAPID VARIABILITY AT 90 GHz
E. E. Epstein, R. Landau, and J. D. G. Rather 15 Dec. 1983 29 p Prepared in cooperation with Minnesota Univ., Minneapolis and BDM Corp., McLean, Va.
(Contract F04701-83-C-0084)
(AD-A136533; TR-0084(4925-07)-2; SD-TR-83-70) Avail: NTIS HC A03/MF A01 CSCL 03/2

Thirty-three extragalactic variable radio sources have been observed at 90 GHz (3.3 mm) over two several-day-long periods in a search for daily and hourly variations. OV-236 (1921-29) showed a decrease in flux density by a factor of 2.7 over a three-day interval, recovering its previous flux density two days later. (OV-236 began a dramatic outburst a few months later.) The other sources exhibited no significant variations approximately > 20%. A summary of previous radio observations of rapid variability is contained in the appendix. Author (GRA)

N84-20452# Army Engineer Topographic Labs., Fort Belvoir, Va.
APPLICABILITY OF STELLAR RATE FOR ASTRONOMIC POSITION DETERMINATION
A. A. Baldini Sep. 1983 13 p Presented at ACSM-ASP Fall Conv., Salt Lake City, 19-23 Sep. 1983
(AD-A135845; ETL-R052) Avail: NTIS HC A02/MF A01 CSCL 08/5

This paper deals with a method of determining an astronomic position by using the star rate of change in azimuth and zenith distance, with respect to time. The star is observed a number of times. Coefficients of Taylor expansion, up to the third order, can be obtained with a high degree of accuracy as a function of sections of a small great circle of arc. Methods of application of observed data, time, zenith distance, and azimuth are considered. They can be reduced to an arbitrarily chosen star position. A comparison of the results so obtained gives a test of the accuracy of the observation. It is shown that astronomic refraction problems can be reduced using the method described in this report.
Author (GRA)

N84-20453# Preston Polytechnic (England). Div. of Physics and Astronomy.
OBSERVATION OF THE INTERSTELLAR ICE GRAIN FEATURE IN THE TAURUS MOLECULAR CLOUDS
D. C. B. Whittet, M. F. Bode (LASL), A. J. Longmore (UKIRT, Hilo, Hawaii), D. W. T. Baines (Keele Univ., England), and A. Evans Los Alamos, N. Mex. LASL 1983 9 p refs Presented at the Lab. and Observational Infrared Spectra of Interstellar Dust Conf., Hilo, Hawaii, 18 Jul. 1983
(Contract W-7405-eng-36)
(DE84-004316; LA-UR-83-3621; CONF-8307110-1) Avail: NTIS HC A02/MF A01

Water ice was originally proposed as a major constituent of the interstellar grain population, the advent of infrared astronomy has shown that the expected absorption due to O-H stretching vibrations at 3 (SIGMA)m is illusive. It is revealed that the carrier of this feature is restricted to regions deep within dense molecular clouds. The exact carrier of this feature however is still controversial, and many questions remain as to the conditions required for its appearance. It is also uncertain whether it is restricted to circumstellar shells, rather than the general cloud medium. The 3 (SIGMA)m band properties are discussed. DOE

N84-20454 Columbia Univ., New York.
AN X-RAY SURVEY OF CLUSTERS OF GALAXIES WITH THE EINSTEIN OBSERVATORY AND A STUDY OF IRON SEDIMENTATION IN THE INTRACLUSTER GAS Ph.D. Thesis
Frank Abramopoulos 1983 162 p
Avail: Univ. Microfilms Order No. DA8327170

A sample of 74 clusters of galaxies were observed in the soft X-ray band with the HEAO-2 satellite, also known as the Einstein Observatory. The measurements of the X-ray luminosities and the X-ray core radii were compared with optical and radio parameters. The correlations that were found favor thermal bremsstrahlung from a hot intracluster gas as the dominant emission mechanism. In addition, there is evidence that a significant fraction of the intracluster gas has its origin inside the galaxies, and is removed from the galaxies by ram pressure. The cluster observations were used to determine the X-ray luminosity function of clusters of galaxies. The results agree with previous measurements. Assuming a reasonable form for the evolution of the X-ray luminosity of the typical cluster, a background contribution from clusters was determined and is about 10% of the soft X-ray background in the 0.5-4.0 keV band. Dissert. Abstr.

N84-20455 California Univ., Berkeley.
MILLIMETER WAVELENGTH APERTURE SYNTHESIS MAPS OF THE STAR-FORMING REGION W58 Ph.D. Thesis
Stuart Newcombe Vogel 1983 125 p
Avail: Univ. Microfilms Order No. DA8329083

A molecular cloud was mapped at 89.2 GHz HCO + (J=1-0) emission from the Hat Creek interferometer, obtaining a resolution of approximately 6 in. Observations of HCN, SO, SiO and H42 alpha are presented, along with data acquired using other instruments. These maps are among the first produced using the Hat Creek millimeter interferometer and demonstrate the viability and potential of millimeter aperture synthesis. The cloud mapped which is called W58 (HCO+), has T > 40 K, n(H2) - > 100,000 cu cm, and M approximately 2000 M solar mass. The maps show a systematic velocity gradient of 8 km s pc extending over more than 1 pc. The velocity gradient is best fitted by rotation of the cloud with velocity increasing outwards, and is consistent with solid body rotation. The cloud rotates at 300 times the local galactic angular velocity in the same direction as the galaxy. A plausible history is that W58 (HCO+) has collapsed from a massive envelope and is now stabilized by rotation against further large-scale contraction. Dissert. Abstr.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-20456 Michigan State Univ., East Lansing.
COMPUTER SIMULATIONS OF GRAVITATIONAL ENCOUNTERS BETWEEN PAIRS OF BINARY STAR SYSTEMS Ph.D. Thesis
James Brian Hoffer 1983 99 p
Avail: Univ. Microfilms Order No. DA8324723

Collisions between pairs of binary stars were computer simulated, categorized, and their exchanged energy cross sections analyzed. Binary/binary collisions released two to three times as much energy as binary/single star collisions and in roughly 40%, a two star collision preceeded possible coalescence. By treating each tightly bound binary as a single star, integration time can be signficantly reduced without statistical effects. Each collision used in the data base ranged between 50,000 and 100,000 integration steps. M.A.C.

N84-20457*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
MOLECULAR CLOUDS AND GALACTIC SPIRAL STRUCTURE
Thomas M. Dame Feb. 1984 278 p refs
(NASA-TP-2288; NAS 1.60:2288; Rept-980) Avail: NTIS HC A13/MF A01 CSCL 03B

Galactic CO line emission at 115 GHz was surveyed in order to study the distribution of molecular clouds in the inner galaxy. Comparison of this survey with similar H1 data reveals a detailed correlation with the most intense 21 cm features. To each of the classical 21 cm H1 spiral arms of the inner galaxy there corresponds a CO molecular arm which is generally more clearly defined and of higher contrast. A simple model is devised for the galactic distribution of molecular clouds. The modeling results suggest that molecular clouds are essentially transient objects, existing for 15 to 40 million years after their formation in a spiral arm, and are largely confined to spiral features about 300 pc wide. Author

N84-20458# California Univ., Livermore. Lawrence Livermore Lab.
APPLICATIONS FOR FISSION PRODUCT DATA TO PROBLEMS IN STELLAR NUCLEOSYNTHESIS
G. J. Matthews Oct. 1983 25 p refs Presented at Spec. Meeting on Yields and Decay of Fission Product Nuclides, Upton, N.Y., 24 Oct. 1983
(Contract W-7405-eng-48)
(DE84-004819; UCRL-89914; CONF-8310104-8) Avail: NTIS HC A012/MF A01

A general overview of the nucleosynthesis mechanisms for heavy (A greater than or equal to 70) nuclei is presented with particular emphasis on critical data needs. The current state of the art in nucleosynthesis model is described and areas in which fission product data may provide useful insight are proposed. The fission product data were divided into four categories (classical r-process, the n-process, p-process, and s-process) and applied to the study of heavy nuclei generation. DOE

N84-20459 Columbia Univ., New York.
MOLECULAR CLOUDS AND GALACTIC SPIRAL STRUCTURE Ph.D. Thesis
Thomas Michael Dame 1983 281 p
Avail: Univ. Microfilms Order No. DA8327201

Galactic CO line emission at 115 GHz was surveyed in the region 12 deg $<l<$ 60 deg and -1 deg $<b<$ 1 deg in order to study the distribution of molecular clouds in the inner galaxy; an inner strip 0 deg .5 wide was sampled every beamwidth (0 deg .125), the rest every two beamwidths. Comparison of the survey with similar HI data reveals a detailed correlation with the most intense 21-cm features, implying that the CO and HI trace the same galactic features and have the same large scale kinematics. To each of the classical 21-cm (HI) spiral arms of the inner galaxy there corresponds a CO molecular arm which is generally more clearly defined and of higher contrast. The higher contrast of the CO spiral features is found to be partially due to the lower velocity dispersion of the CO (4.5 km/sec). The remaining difference in contrast cannot be attributed to streaming motions since both species have essentially the same large scale kinematics. It is concluded that the arm-interarm contrast for the galactic CO emission is more than twice that of the 21-cm emission.
Dissert. Abstr.

N84-20460 California Univ., Berkeley.
THE ROLE OF H/SUB 2O IN MOLECULAR CLOUDS: LINE TRANSFER AND THERMAL BALANCE IN WARM DUSTY MEDIUM Ph.D. Thesis
Takamasa Takahashi 1983 115 p
Avail: Univ. Microfilms Order No. DA8329059

The heating of gas in optically thick molecular clouds with embedded luminosity sources is studied. The dust is heated by the flow of infrared luminosity out of the cloud and assumes temperatures which range from 10 to 300 K. The main heating mechanisms for the gas are by direct collisions with the dust grains and by collisions with H2O molecules, which are radiatively excited by dust infrared emission. The latter process is quantitatively treated in a simple model of the thermal balance in such clouds. The effects of each cloud parameter on the thermal structure and the emergent molecular line intensities are studied for a linearly expanding cloud. H2O lines appear both in emission at long wavelength (lambda approx $>$ 100 microns) and in absorption at shorter wavelengths. Dissert. Abstr.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N84-20461# National Inst. of Polar Research, Tokyo (Japan).
METEORITES NEWS. JAPANESE COLLECTION OF ANTARCTIC METEORITES, VOLUME 1, NUMBER 1
May 1982 31 p
Avail: NTIS. HC A03/MF A01

Data sheets are presented for a number of meteorites collected from the bare ice area near the Yamato Mountains by the Japanese Antarctic Research Expedition in the 1979 field season, and one large carbonaceous chondrite from the Belgica Mountains. Preliminary descriptions of the hand specimens and thin sections are given. A.R.H.

N84-19453# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
EXACT SOLUTION FOR EMISSION FROM SURFACE ELEMENTS OF A PLANET
J. Doenecke *In* ESA Environ. and Thermal Control Systems for Space Vehicles Dec. 1983 p 471-476 refs (For primary document see N84-19396 10-18)
Avail: NTIS HC A25/MF A01

N84-20462*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANTARCTIC METEORITE NEWSLETTER. VOLUME 7, NUMBER 1: SAMPLE REQUESTS AND ALLOCATIONS
Feb. 1984 45 p
(NASA-TM-85559; NAS 1.15:85559) Avail: NTIS HC A03/MF A01 CSCL 03B

Antarctic meteorites, achondrites, carbonaceous chondrites, ions, and stony-irons are classified. N.W.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-20463# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OSCILLATION PHENOMENA IN THE SOLAR ATMOSPHERE AND MODULATION BY MICROWAVE RADIATION M.S. Thesis - 20 Dec. 1982 [FENOMENOS OSCILATORIOS NA ATMOSFERA SOLAR E MODULACAO DA RADIACAO EM MICROONDAS]
Ana Maria Zodi Vaz May 1983 95 p refs In PORTUGUESE; ENGLISH summary
(INPE-2743-TDL/134) Avail: NTIS HC A05/MF A01

An overview of the principal known descriptions of oscillations in the solar atmosphere at different ranges of periods was developed. Particular attention was given to oscillations with time scale of seconds, associated to active regions or bursts. 1.5 quasi-periodic oscillations were detected by the first time at more than one microwave frequency simultaneously (22 GHz and

44 GHz), with high sensitivity and high time resolution, superimposed on a burst on Dec. 15, 1980. An advance phase of 0.3 sec between the oscillations in the frequencies of 22 GHz and 44 GHz was discovered. The proposed mechanism to explain such oscillations is based on oscillations of the magnetic field at the source. These oscillations modulate the gyro-synchrotron emission from high energy electrons trapped in the magnetic structure. The phase difference is attributed to the influence of the optical thickness of the gyro-synchrotron emission at 22 GHz. Author

N84-20464*# California Inst. of Tech., Pasadena. Solar Observatory.
DYNAMIC SIGNATURES OF QUIET SUN MAGNETIC FIELDS
S. F. Martin 1983 32 p refs Presented at Sacramento Peak Workshop on Small-Scale Dyn. Processes, 25-29 Jul. 1983
(Grants NGL-05-002-034; NSF ATM-82-11002; AF-AFOSR-0018-82)
(NASA-CR-173361; NAS 1.26:173361; BBSO-0228) Avail: NTIS HC A03/MF A01 CSCL 03B

The collision and disappearance of opposite polarity fields is observed most frequently at the borders of network cells. Due to observational limitations, the frequency, magnitude, and spatial distribution of magnetic flux loss have not yet been quantitatively determined at the borders or within the interiors of the cells. However, in agreement with published hypotheses of other authors, the disapperance of magnetic flux is speculated to be a consequence of either gradual or rapid magnetic reconnection which could be the means of converting magnetic energy into the kinetic, thermal, and nonthermal sources of energy for microflares, spicules, the solar wind, and the heating of the solar corona. Author

N84-20465*# Maryland Univ., College Park. Astronomy Program.
A HIGH RESOLUTION SOLAR ATLAS FOR FLUORESCENCE CALCULATIONS
Michael F. Hearn, John T. Ohlmacher, and David G. Schleicher 29 Jul. 1983 34 p refs
(Grant NsG-7322)
(NASA-CR-173366; NAS 1.26:173366; TR-AP83-044) Avail: NTIS HC A03/MF A01 CSCL 03B

The characteristics required of a solar atlas to be used for studying the fluorescence process in comets are examined. Several sources of low resolution data were combined to provide an absolutely calibrated spectrum from 2250 A to 7000A. Three different sources of high resolution data were also used to cover this same spectral range. The low resolution data were then used to put each high resolution spectrum on an absolute scale. The three high resolution spectra were then combined in their overlap regions to produce a single, absolutely calibrated high resolution spectrum over the entire spectral range. A.R.H.

N84-20466# Tufts Univ., Medford, Mass. Dept. of Physics.
POSSIBLE DETECTION OF THERMAL CYCLOTRON LINES FROM SMALL SOURCES WITHIN SOLAR ACTIVE REGIONS Interim Report
R. F. Willson Jul. 1983 25 p
(Grant AF-83-0019; AF Proj. 2311)
(AD-A136218; AFOSR-83-1138TR) Avail: NTIS HC A02/MF A01 CSCL 03/2

Theoretical spectra of thermal cyclotron line emission from solar active regions are presented for two frequency bands available at the Very Large Array (VLA). VLA synthesis maps of three active regions at 1380, 1540 and 1705 MHz are then presented. The maps of two of these regions show significant changes in the brightness temperature within these narrow frequency ranges. We show that these changes may be attributed to thermal cyclotron line emission in small regions (theta = 10 ins to 30 ins) where the magnetic field is relatively constant with H = 125-180 Gauss. An alternative interpretation, involving height-dependent variations in the physical conditions may also explain the changes in one of these regions. The potential to study coronal magnetic fields using VLA observations of cyclotron lines is also discussed. GRA

N84-20467# Los Alamos Scientific Lab., N. Mex.
SOLAR FLARES: AN EXTREME OF RECONNECTION
S. A. Colgate 22 Dec. 1983 11 p refs Presented at Chapman Conf. on Magnetic Reconnection, Los Alamos, N. Mex., 3 Oct. 1983
(Contract W-7405-eng-36)
(DE84-004413; LA-UR-83-3704; CONF-8310229-2) Avail: NTIS HC A02/MF A01

Three points are emphasized: that the solar flare is that particular astrophysical phenomenon that is the extremum of reconnection, no other phenomenon demands as rapid magnetic flux annihilation as is seen in the solar flare; that plasma physics experiments can and should be performed in the laboratory that model reconnection as observed in astrophysics; and that stochastic field lines derived from something similar to Alfven wave turbulence are a neccesary part of reconnection. DOE

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-20468*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THEORETICAL STUDIES OF X-RAY EMISSION FROM SUPERNOVA REMNANTS AND OTHER NON-EQUILIBRIUM ASTROPHYSICAL PLASMAS Final Report, 1 Nov. 1980 - 29 Feb. 1984
A. K. Dupree Mar. 1984 10 p refs
(Grant NAGw-117)
(NASA-CR-175394; NAS 1.26:175394) Avail: NTIS HC A02/MF A01 CSCL 03B

To improve the accuracy of thermal X-ray emission spectrum predictions, new computations of electron excitation rates, dielectric recombination rates, and updated codes were applied to existing data on supernova remnants and O star winds. Because of its general predominance along with low ionization and recombination rates, Fe(XVII) was analyzed with the inclusion of resonances to the excitation rate data. Corrections to the existing dielectric recombination rates based on detailed Fe (XVII) calculations and the more approximate Quantum Defect Method were accomplished. by using Distorted Wave ionization rates and reliable excitation rates, models for X-ray, ultraviolet, and optical emission line intensities of non-radiative shock wave can be constructed that supply data on shock velocity, preshock ionization states, and elemental abundances. The radiative driving force that drives the shock wave is calculated through line opacities of the shocked gas. X-ray emission spectra are also calculated for O star winds. M.A.C.

N84-20469# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
GALACTIC GAMMA RADIATION AND THE INTERSTELLAR MEDIUM [GALAKTISCHE GAMMASTRAHLUNG UND DAS INTERSTELLARE MEDIUM]
Manfred Gottwald Jul. 1983 200 p refs In GERMAN
(MPE-179; ISSN-0340-8922) Avail: NTIS HC A09/MF A01

Diffuse gamma radiation (energy between 70 and 5000 MeV) measured by COS-B satellites was analyzed. The instrumental properties of the COS-B gamma telescope and their effects on the measurements are discussed. Measured and simulated data are compared in order to predict diffuse gamma radiation. The medium gamma spectrum in the galactic plane is shown to be constant in first approximation. The distribution of the diffuse gamma emission in the galactic anticenter is determined. For the investigation of local gamma emission the atlasses of galactic dark nebulae of Lynds and of Khavtassi are used. The main contribution to diffuse gamma radiation is found to come from

gas correlated to interstellar dust, and not from molecular hydrogen concentrated in the most massive molecular clouds. Author (ESA)

N84-20470 California Univ., Berkeley.
ROCKET OBSERVATIONS OF THE DIFFUSE ULTRAVIOLET BACKGROUND Ph.D. Thesis
Peter Jakobsen 1983 143 p
Avail: Univ. Microfilms Order No. DA8328923

The purpose of the experiment described was to obtain information on the absolute intensity and spatial variation of the diffuse ultraviolet background and thereby gain insight into the origin of this radiation. The instrument consisted of three ulraviolet broad band photometers placed in the focal plane of a 95cm, f/2.8 normal incidence telescope flown onboard an Aries sounding rocket. The effective wavelengths of the three channels were wavelength 1590A, wavelength 1710A and wavelength 2135A. Absolute intensity measurements are presented for directions toward high galactic latitudes and along a 50.5 deg scan path at an intermediate latitude of b approximately 50. The fully reduced data indicate that the absolute intensity of the diffuse ultraviolet background is relatively high. The median observed intensities in the three channels are 2090 photons/(s sq cm sr A) at 2135A, 990 photons/(s sq cm sr A) at 1710 A and 810 photons/(s sq cm sr A) at 1590A. Based on laboratory and in-flight calibrations, the overall accuracy of these absolute intensities is expected to be better than 25%. The target intensities in all thre chanels are shown to display significant large scale, as well as small scale, spatial variation and to correlate with line of sight neutral hydrogen column density as determined from 21 cm radio observations. These results are in accord with the conclusions of several previous investigations and demonstrate that there is a galactic component to the diffuse ultraviolet background. As to the origin of this galactic emission, it is shown that the observed relationship between background intensity and hydrogen column is reasonable quantitative agreement with that expcted from scattering of galactic plante starlight off high latitude interstellar grains. Dissert. Abstr.

99 GENERAL

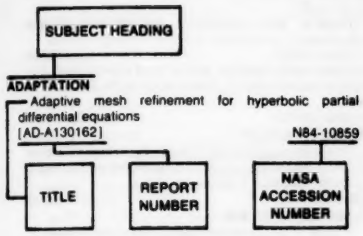
N84-20471# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
AIR FORCE TECHNICAL OBJECTIVE DOCUMENT FISCAL YEAR 1985
Oct. 1983 61 p Supersedes AFWAL-TR-82-3000
(AF Proj. 9991)
(AD-A136724; AFWAL-TR-83-3000; AFWAL-TR-82-3000) Avail: NTIS HC A04/MF A01 CSCL 01/3

The document presents an overview of the five laboratory thrusts extracted from the FY 85 Research and Technology Plan of the Flight Dynamics Laboratory. Technical objectives are described for the thrusts of Night In-Weather; Supersonic Persistence; Sortie Generation; Space (and Missile) Applications; and Multimission Core Technology. GRA

N84-20472# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 38, NUMBER 1 Monthly Publication
L. E. Shaffer Jan. 1984 70 p
(AD-A136868; ESN-38-1) Avail: NTIS HC A04/MF A01 CSCL 05/2

Topics include: Gender mixed crews on Dutch combat ships; Max-Planck Institute for psycholinguistics; cancer therapy with magnetism; 9th European Underwater Biomedical Society Convention; international center for genetic engineering and biotechnology; Biotechnological Route to Polyphenylene; 2nd Romania US Seminar on polymer chemistry; statistical climatology; a code for generating dynamic models of robots; fifth generation computing systems; new data logger; erosion by liquid and solid impact, ELSI VI; physical chemistry of the solid state metals and alloys; NATO buys a new oceanographic research vessel; oceanexpo/ oceantropiques 1984; progress in development of wave energy to generate electricity; IAPSO symposia and oceanography at the 18th IUGG; new decision support system; high energy channeling research in Switzerland; muon catalyzed fusion; 2nd international symposium on acoustic remote sensing of the atmosphere and ocean; and support of science research by the british military.
GRA

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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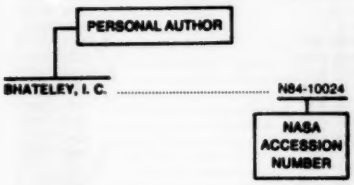

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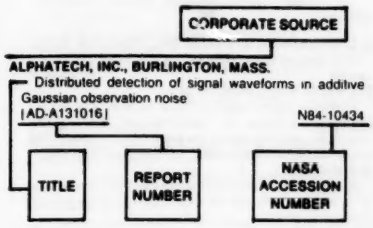

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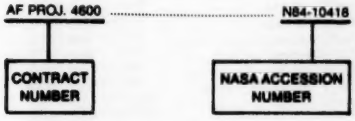

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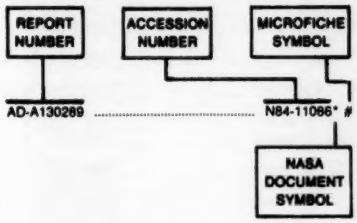

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AFIT/GAE/AA/83D-24 N84-19295 #
AFIT/GAE/AA/83D-27 N84-19485 #
AFIT/GAE/ENY/83D-5 N84-19758 #
AFIT/GAE/ENY/83D-11 N84-19293 #
AFIT/GSO/AA/83D-1 N84-19386 #
AFIT/GSO/AA/83D-2 N84-19465 #
AFLRL-167 N84-19817 #
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AFOSR-81-0154TR N84-20295 #
AFOSR-83-0901TR N84-20147 #
AFOSR-83-1138TR N84-20466 #
AFOSR-83-1201TR N84-19789 #
AFOSR-83-1256TR N84-20298 #
AFOSR-83-1282TR N84-19761 #
AFOSR-83-1283TR N84-19298 #
AFOSR-83-1284TR N84-20295 #
AFOSR-83-1286TR N84-19788 #
AFOSR-83-1287TR N84-19299 #
AFOSR-83-1288TR N84-19763 #
AFOSR-83-1289TR N84-20296 #
AFOSR-83-1295TR N84-20344 #

AFOSR-83-1296TR ..... N84-20291 #
AFOSR-83-1298TR ..... N84-19505 #
AFOSR-83-1299TR ..... N84-20405 #
AFOSR-83-1309TR ..... N84-20234 #
AFOSR-83-1311TR ..... N84-19586 #
AFOSR-83-1314TR ..... N84-20345 #
AFOSR-83-1316TR ..... N84-20323 #
AFOSR-83-1319TR ..... N84-20290 #
AFOSR-83-1321TR ..... N84-19765 #
AFOSR-83-1323TR ..... N84-20292 #
AFOSR-83-1331TR ..... N84-20235 #
AFOSR-83-1333TR ..... N84-20276 #
AFOSR-83-1336TR ..... N84-19764 #
AFOSR-83-1340TR ..... N84-20191 #
AFOSR-83-1341TR ..... N84-19935 #
AFOSR-83-1344TR ..... N84-19300 #
AFOSR-83-1346TR ..... N84-20312 #
AFOSR-83-1347TR ..... N84-20390 #
AFOSR-83-1348TR ..... N84-19750 #
AFOSR-84-0001TR ..... N84-19486 #
AFOSR-84-0002TR ..... N84-20343 #
AFOSR-84-0004TR ..... N84-20246 #
AFOSR-84-0005TR ..... N84-20245 #
AFOSR-84-0006TR ..... N84-20294 #

AFWAL-TR-82-3000 ..... N84-20471 #
AFWAL-TR-82-4063-PT-3-VOL-2 ..... N84-20240 #
AFWAL-TR-83-2015 ..... N84-19314 #
AFWAL-TR-83-2033 ..... N84-19337 #
AFWAL-TR-83-3000 ..... N84-20471 #
AFWAL-TR-83-3082-VOL-1 ..... N84-19340 #
AFWAL-TR-83-3082-VOL-2 ..... N84-19341 #

AGF-DOK-1/1983 ..... N84-20429 #
AGF-DOK-2/1983 ..... N84-20430 #

AMI-014 ..... N84-20409 #

AMMRC-TR-83-55 ..... N84-19583 #
AMMRC-TR-83-59 ..... N84-20241 #

AMRC-R-524 ..... N84-20329 #

ANL-FPP-83-1-VOL-1 ..... N84-20392 #

ANL-83-96 ..... N84-20251 #

AP-J2-04225 ..... N84-19962* #

APR-1 ..... N84-20023 #

AR-1 ..... N84-19479* #
AR-1 ..... N84-20191 #
AR-3 ..... N84-19534 #

ARBRL-IMR-794 ..... N84-19753 #

ARBRL-MR-03325 ..... N84-19753 #

ARBRL-TR-02535 ..... N84-19289 #

ARI-RN-83-50 ..... N84-20428 #
ARI-RN-83-51 ..... N84-20184 #
ARI-RN-83-52 ..... N84-19791 #
ARI-RN-83-53 ..... N84-19790 #

ARL-TR-83-41 ..... N84-20278 #

ASR-4 ..... N84-19571 #

ATAC0-SV8007-2 ..... N84-20284 #

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BAR-2 ..... N84-19510 #

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BBN-5499 ..... N84-20185 #

BBSO-0228 ..... N84-20464* #

BDM/A-83-020-TR ..... N84-19671 #
BDM/A-83-020-TR-VOL-3-PT-3 ..... N84-19673 #
BDM/A-83-020-TR-VOL-3-PT-4 ..... N84-19674 #
BDM/A-83-170-TR ..... N84-19669 #
BDM/A-83-172-TR ..... N84-19670 #

BDX-613-3009 ..... N84-19551 #

BLM-DCS-PT-83-003-4420 ..... N84-20005 #

BLM-YA-PT-83-002-4335 ..... N84-20078 #

BLM/TN-359 ..... N84-20078 #

BM-RI-8807 ..... N84-19594 #

BMFT-FB-DV-83-003 ..... N84-20348 #

BMFT-FB-HA-83-028 ..... N84-19822 #

BMFT-FB-T-83-170-VOL-1 ..... N84-19724 #
BMFT-FB-T-83-170-VOL-2 ..... N84-19725 #
BMFT-FB-T-83-183 ..... N84-20034 #
BMFT-FB-T-83-184 ..... N84-19518 #
BMFT-FB-T-83-194 ..... N84-20419 #
BMFT-FB-T-83-195 ..... N84-19555 #
BMFT-FB-T-83-202 ..... N84-19778 #
BMFT-FB-T-83-204 ..... N84-20026 #
BMFT-FB-T-83-205 ..... N84-19613 #
BMFT-FB-T-83-206 ..... N84-19801 #
BMFT-FB-T-83-210 ..... N84-19733 #
BMFT-FB-T-83-211 ..... N84-20073 #
BMFT-FB-T-83-212 ..... N84-19519 #
BMFT-FB-T-83-213 ..... N84-19558 #
BMFT-FB-T-83-214 ..... N84-19614 #
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BMFT-FB-T-83-219 ..... N84-19559 #
BMFT-FB-T-83-220 ..... N84-19616 #
BMFT-FB-T-83-224 ..... N84-19520 #
BMFT-FB-T-83-225 ..... N84-19734 #
BMFT-FB-T-83-227 ..... N84-20024 #
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BMFT-FB-T-83-247 ..... N84-20349 #
BMFT-FB-T-83-248 ..... N84-19557 #
BMFT-FB-T-83-249 ..... N84-19697 #
BMFT-FB-T-83-251 ..... N84-19617 #
BMFT-FB-T-83-261 ..... N84-19729 #
BMFT-FB-T-83-267 ..... N84-19730 #
BMFT-FB-T-83-277 ..... N84-19731 #
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BMFT-FB-W-83-018 ..... N84-19343 #
BMFT-FB-W-83-022 ..... N84-20001 #
BMFT-FB-W-83-023 ..... N84-19727 #
BMFT-FB-W-83-025 ..... N84-20044 #
BMFT-FB-W-83-026 ..... N84-19776 #
BMFT-FB-W-83-027 ..... N84-19356 #
BMFT-FB-W-83-028 ..... N84-19344 #
BMFT-FB-W-83-030 ..... N84-19728 #
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BNL-33981 ..... N84-19545 #
BNL-33986 ..... N84-19808 #
BNL-34014 ..... N84-19796 #
BNL-34069 ..... N84-19811 #

C-480 ..... N84-20018 #

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CALSPAN-7028-M-1 ..... N84-20084 #
CALSPAN-7177-A-1 ..... N84-20295 #

CE-64(83)AFOSR-993-1 ..... N84-20298 #

CECOM-80-0520-1 ..... N84-19714 #

CMU-RI-TR-83-18 ..... N84-20269 #
CMU-RI-TR-83-21 ..... N84-20424 #
CMU-RI-TR-83-23 ..... N84-20316 #
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CONF-830430-3 ..... N84-19487 #
CONF-830831-3 ..... N84-20299 #
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CONF-831203-66 ..... N84-20393 #
CONF-831243-4 ..... N84-19794 #
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CONF-8307110-1 ..... N84-20453 #
CONF-8308154-1 ..... N84-19515 #
CONF-8309118-6 ..... N84-19808 #
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CONF-8309191-1 ..... N84-20253 #
CONF-8310104-8 ..... N84-20458 #
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CONF-8310172-10 ..... N84-19796 #
CONF-8310182-6 ..... N84-20249 #
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CONF-8310229-1 ..... N84-20071 #
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CONF-8310229-4 ..... N84-20398 #
CONF-8310241-1 ..... N84-19514 #
CONF-8310243-1 ..... N84-20441 #
CONF-8310244-1 ..... N84-20440 #
CONF-8311116-1 ..... N84-19612 #

COO-2218-296 ..... N84-20397 #
COO-2754-9 ..... N84-19591 #
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CRC-APRAC-CAPM-48-83 ..... N84-20148 #

CRC-534 ..... N84-19366 #
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CSIE-83-10 ..... N84-20181 #
CSIE-83-13 ..... N84-20190 #
CSIE-83-14 ..... N84-20189 #
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CSIR-ME-1485-PT-3 ..... N84-19604 #

CSIRO-TP-3/1-35(1983) ..... N84-20040 #

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DE83-015249 ..... N84-19592 #
DE83-015841 ..... N84-19797 #
DE83-016527 ..... N84-19515 #
DE84-000030 ..... N84-19686 #
DE84-000052 ..... N84-19837 #
DE84-000094 ..... N84-20022 #
DE84-000627 ..... N84-19721 #
DE84-001811 ..... N84-20019 #
DE84-001976 ..... N84-20418 #
DE84-001981 ..... N84-20441 #
DE84-002189 ..... N84-19819 #
DE84-002367 ..... N84-19720 #
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DE84-002436 ..... N84-20332 #
DE84-002640 ..... N84-19997 #
DE84-002916 ..... N84-19514 #
DE84-003050 ..... N84-19550 #
DE84-003107 ..... N84-19686 #
DE84-003167 ..... N84-20416 #
DE84-003257 ..... N84-19553 #
DE84-003292 ..... N84-19936 #
DE84-003299 ..... N84-20333 #
DE84-003319 ..... N84-20335 #
DE84-003401 ..... N84-19590 #
DE84-003403 ..... N84-19512 #
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DE84-003657 ..... N84-20392 #
DE84-003691 ..... N84-19807 #
DE84-003821 ..... N84-19798 #
DE84-003826 ..... N84-20249 #
DE84-003833 ..... N84-20070 #
DE84-003856 ..... N84-19767 #
DE84-003920 ..... N84-19995 #
DE84-004046 ..... N84-19719 #
DE84-004075 ..... N84-20253 #
DE84-004088 ..... N84-19543 #
DE84-004089 ..... N84-19509 #
DE84-004109 ..... N84-20072 #

DE84-004135 ..... N84-20422 #
DE84-004146 ..... N84-19771 #
DE84-004148 ..... N84-19809 #
DE84-004157 ..... N84-20398 #
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DE84-004166 ..... N84-19722 #
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DE84-004175 ..... N84-19545 #
DE84-004196 ..... N84-19603 #
DE84-004202 ..... N84-20415 #
DE84-004203 ..... N84-20033 #
DE84-004211 ..... N84-19591 #
DE84-004212 ..... N84-20414 #
DE84-004264 ..... N84-19792 #
DE84-004289 ..... N84-19796 #
DE84-004311 ..... N84-20250 #
DE84-004316 ..... N84-20453 #
DE84-004321 ..... N84-20395 #
DE84-004322 ..... N84-20399 #
DE84-004327 ..... N84-19685 #
DE84-004328 ..... N84-20396 #
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DE84-004334 ..... N84-20394 #
DE84-004335 ..... N84-20071 #
DE84-004343 ..... N84-19546 #
DE84-004354 ..... N84-19812 #
DE84-004355 ..... N84-19769 #
DE84-004356 ..... N84-19513 #
DE84-004368 ..... N84-19818 #
DE84-004374 ..... N84-19551 #
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DE84-004413 ..... N84-20467 #
DE84-004414 ..... N84-19820 #
DE84-004424 ..... N84-20393 #
DE84-004432 ..... N84-19538 #
DE84-004442 ..... N84-19799 #
DE84-004456 ..... N84-20440 #
DE84-004573 ..... N84-19794 #
DE84-004586 ..... N84-19785 #
DE84-004594 ..... N84-19547 #
DE84-004602 ..... N84-20318 #
DE84-004635 ..... N84-19795 #
DE84-004689 ..... N84-19487 #
DE84-004735 ..... N84-19808 #
DE84-004761 ..... N84-19488 #
DE84-004762 ..... N84-19510 #
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DE84-004850 ..... N84-19612 #
DE84-004853 ..... N84-20319 #
DE84-004875 ..... N84-19541 #
DE84-004877 ..... N84-19544 #
DE84-004878 ..... N84-19549 #
DE84-004879 ..... N84-19548 #
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DE84-004881 ..... N84-19542 #
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DE84-004933 ..... N84-19539 #
DE84-004986 ..... N84-20397 #
DE84-004996 ..... N84-20299 #
DE84-005058 ..... N84-20248 #
DE84-005072 ..... N84-19821 #
DE84-005083 ..... N84-19611 #
DE84-005114 ..... N84-20324 #
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DE84-005152 ..... N84-19806 #
DE84-005160 ..... N84-19793 #
DE84-005167 ..... N84-19489 #
DE84-005188 ..... N84-19766 #
DE84-005190 ..... N84-19507 #
DE84-005193 ..... N84-19768 #
DE84-005254 ..... N84-20417 #
DE84-005339 ..... N84-20023 #
DE84-005341 ..... N84-20021 #
DE84-005361 ..... N84-19811 #
DE84-005391 ..... N84-19552 #
DE84-005440 ..... N84-20251 #

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DFVLR-FB-83-18 ..... N84-19696 #
DFVLR-FB-83-27 ..... N84-20000 #
DFVLR-FB-83-28 ..... N84-19303 #
DFVLR-FB-83-31 ..... N84-20097 #
DFVLR-FB-83-32 ..... N84-19329 #

DFVLR-MITT-81-19 ..... N84-19307 #
DFVLR-MITT-83-11 ..... N84-19695 #
DFVLR-MITT-83-16 ..... N84-19480 #

DFVRL-MITT-83-17 ..... N84-19775 #

DME-DM-3 ..... N84-20281 #

DOE/AL-04047/T12 ..... N84-19721 #

DOE/CH-00016/1 ..... N84-20033 #

DOE/CS-50286/4 ..... N84-19603 #
DOE/CS-83111/T1 ..... N84-20021 #

DOE/DP-40124/10 ..... N84-19807 #

DOE/ER-02754/9 ..... N84-19591 #
DOE/ER-02945/7 ..... N84-19509 #
DOE/ER-04938/5 ..... N84-19489 #
DOE/ER-05002/37 ..... N84-20416 #
DOE/ER-05776/12 ..... N84-20417 #
DOE/ER-10428/5 ..... N84-19543 #
DOE/ER-10473/T1 ..... N84-19818 #
DOE/ER-10475/T2 ..... N84-19552 #
DOE/ER-10612/9 ..... N84-20332 #
DOE/ER-10671/2 ..... N84-19510 #
DOE/ER-10711/2 ..... N84-20422 #
DOE/ER-10740/12 ..... N84-20414 #
DOE/ER-10855/2 ..... N84-19516 #
DOE/ER-10866/3 ..... N84-20415 #
DOE/ER-10942/5 ..... N84-19538 #
DOE/ER-12022/2 ..... N84-19768 #
DOE/ER-12038/3 ..... N84-19540 #
DOE/ER-12038/9 ..... N84-19541 #
DOE/ER-12038/10 ..... N84-19549 #
DOE/ER-12038/11 ..... N84-19544 #
DOE/ER-12038/12 ..... N84-19548 #
DOE/ER-13026/1 ..... N84-20023 #
DOE/ER-30041/T1 ..... N84-20020 #
DOE/ER-53122/2 ..... N84-19806 #

DOE/ET-15440/T1 ..... N84-19720 #
DOE/ET-25209/1 ..... N84-19511 #
DOE/ET-27111/T2 ..... N84-19996 #
DOE/ET-29069/T2 ..... N84-19719 #
DOE/ET-52040/296 ..... N84-20397 #

DOE/EV-10097/5 ..... N84-20072 #

DOE/ID-01717/4 ..... N84-19997 #
DOE/ID-12423/T1 ..... N84-19507 #

DOE/NASA/0258-1 ..... N84-20014* #
DOE/NASA/51044-33 ..... N84-20017* #
DOE/NASA/51044-34 ..... N84-20016* #

DOE/PC-50796/T3 ..... N84-19771 #

DOE/RL-01830/T10 ..... N84-19819 #

DOT-TSC-RSPA-83-11 ..... N84-19332 #

DOT/FAA/ES-83/4 ..... N84-19328 #
DOT/FAA/ES-83/5 ..... N84-19324 #
DOT/FAA/ES-83/8 ..... N84-19325 #
DOT/FAA/ES-83/10 ..... N84-19326 #

DREO-TN-82-41 ..... N84-19599 #
DREO-TN-82-42 ..... N84-19600 #
DREO-TN-83-4 ..... N84-19579 #
DREO-TN-83-20 ..... N84-19575 #
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DTNSRDC-CMLD-83/27 ..... N84-20244 #

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DTNSRDC/SME-83/65 ..... N84-19532 #

D6-47113 ..... N84-19281* #
D180-25927-4 ..... N84-19337 #
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E-1752 ..... N84-19741* #
E-1831 ..... N84-20016* #
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E-2012 ..... N84-20404* #
E-2023 ..... N84-20258* #
E-2025 ..... N84-20259* #

EGG-SE-6451 ..... N84-19766 #

ENST-E-83010 ..... N84-19689 #

EPA-600/D-82-026 ..... N84-20038 #

EPL-83-5/ONR-83-5 ..... N84-20182 #
EPL-83-6/ONR-83-6 ..... N84-20183 #

ERC-TR-83020 ..... N84-20014* #

ER83-4203 ..... N84-19805 #

ESA-CR(P)-784 ..... N84-20012* #

ESA-SP-200 ..... N84-19396 #

ESA-TT-744 ..... N84-19307 #
ESA-TT-844 ..... N84-20347 #
ESA-TT-845 ..... N84-19696 #
ESA-TT-846 ..... N84-20000 #
ESA-TT-847 ..... N84-19329 #
ESA-TT-848 ..... N84-19695 #
ESA-TT-849 ..... N84-19480 #
ESA-TT-850 ..... N84-19775 #

ESD-TR-83-049 ..... N84-19661 #
ESD-TR-83-054 ..... N84-19678 #
ESD-TR-83-070 ..... N84-19387 #
ESD-TR-83-106 ..... N84-19664 #
ESD-TR-83-109 ..... N84-20279 #
ESD-TR-83-214 ..... N84-20247 #
ESD-TR-83-219 ..... N84-19683 #

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ETL-R053 ..... N84-19388 #

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EUT-82-E-128-PT-1 ..... N84-20260 #
EUT-82-E-129-PT-2 ..... N84-20261 #
EUT-82-E-130 ..... N84-20254 #
EUT-82-E-131 ..... N84-20262 #
EUT-82-E-132 ..... N84-19698 #
EUT-83-E-134 ..... N84-20420 #
EUT-83-E-135 ..... N84-20271 #
EUT-83-E-136 ..... N84-19330 #
EUT-83-E-137 ..... N84-19736 #
EUT-83-E-138 ..... N84-20315 #
EUT-83-E-139 ..... N84-20400 #
EUT-83-E-140 ..... N84-19699 #
EUT-83-E-141 ..... N84-19737 #
EUT-83-E-142 ..... N84-19700 #

EW-U2-04243 ..... N84-19959* #
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NASA-CR-175422 ..... N84-20135* #
NASA-CR-175423 ..... N84-19620* #
NASA-CR-175425 ..... N84-20197* #

NASA-SP-7011(255) N84-20134*
NASA-SP-7037(170) N84-20133*
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NASA-SP-7039(24)-SECT-1 ..... N84-20432*
NASA-SP-7039(24)-SECT-2 ..... N84-20433*
NASA-SP-7043(39) N84-20011*

NASA-TM-76962 ..... N84-19335* #
NASA-TM-77027 ..... N84-19563* #
NASA-TM-77096 ..... N84-20127* #
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NASA-TM-77314 ..... N84-20196* #

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NASA-TM-83504 N84-20017* #
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NASA-TM-83606 N84-20259* #
NASA-TM-85108 N84-19493* #
NASA-TM-85556 N84-19382* #
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NASA-TM-85562 N84-19961* #
NASA-TM-85732 N84-19287* #
NASA-TM-85753 N84-19565* #
NASA-TM-85762 N84-19395* #
NASA-TM-85764 N84-20325* #
NASA-TM-85846 N84-19362* #
NASA-TM-85876 N84-19475* #
NASA-TM-85883 N84-20125* #
NASA-TM-85884 N84-20176* #
NASA-TM-85895 N84-19334* #
NASA-TM-85929 N84-20128* #
NASA-TM-86066 N84-19956* #
NASA-TM-86068 N84-19955* #

NASA-TP-2225 N84-19741* #
NASA-TP-2255 N84-19393* #
NASA-TP-2261 N84-20155* #
NASA-TP-2288 N84-20457* #
NASA-TP-2291 N84-19333* #
NASA-TP-2295 N84-19564* #

NATICK/TR-83/045 N84-19601 #

NAUFP-202-2 N84-19927* #

NAVTRAEQUIPC-IH-347 N84-20156 #

NAVTRAEQUIPC-TN-66 N84-19367 #

NAVTRAEQUIPC-78-C-0113-4 N84-20160 #
NAVTRAEQUIPC-79-C-0104-1 N84-20168 #
NAVTRAEQUIPC-80-C-0063-2 N84-20169 #
NAVTRAEQUIPC-81-C-0105-8 N84-19351 #

NBS-GCR-83-445-VOL-1 N84-19595 #

NBS-TN-1181 N84-19781 #

NCAR-ADMP-83-2 N84-20037 #

NCAR-TN-215 N84-20037 #

NCAR/TN-214/STR N84-20035 #

NDRE/PUBL-83/1001 N84-20136 #

NDU/ICAF-83/013 N84-19390 #

NISC-TRANS-7224 N84-19336 #

NLR-MP-82046-U N84-19774 #
NLR-MP-82047-U N84-20442 #
NLR-MP-82048-U N84-19355 #
NLR-MP-82056-U N84-20300 #
NLR-MP-82058-U N84-19556 #

NMERI-TA5-11 N84-19608 #

NOAA-DL-ERL-GFDL-3 N84-20101 #

NOAA-NWS-ERCP-14 N84-20103 #

NOAA-NWS-TDL-CP-83-3 N84-20098 #

NOAA-83101201 N84-20112 #
NOAA-83120104 N84-20099 #
NOAA-83120502 N84-20074 #
NOAA-83120901 N84-20098 #
NOAA-83120902 N84-20075 #
NOAA-83121404 N84-20100 #
NOAA-83121901 N84-20101 #
NOAA-83122001 N84-20102 #
NOAA-84010305 N84-20103 #

NOAA/TM-OAO-1 N84-20099 #

NOAA/TM/NWS/NMC-67 N84-20112 #

NORDA-TN-206 N84-20111 #
NORDA-TN-209 N84-20110 #

NOSC/TD-649 N84-20237 #

NOSC/TR-860 N84-19716 #

NPRDC-TR-84-4 N84-20187 #

NPS54-83-014 N84-20444 #
NPS55-83-023 N84-19327 #
NPS68-83-005 N84-20109 #

NRC-22797 N84-20281 #

NRL-MR-5224 N84-19662 #
NRL-MR-5234 N84-20068 #
NRL-MR-5235 N84-20277 #
NRL-MR-5243 N84-19749 #
NRL-MR-5248 N84-19466 #
NRL-MR-5252 N84-20327 #
NRL-MR-5253 N84-19596 #

NRL-8778 N84-19318 #

NSF/MEA-83011 N84-19618 #
NSF/MEA-83013 N84-19562 #

NSMRL-1014 N84-20179 #

NTIA-CR-83-25 N84-19702 #
NTIA-CR-83-27 N84-19703 #

NUSC-TR-7079 N84-19666 #

NUSC/TR-6887 N84-19668 #

NWC-TP-6481 N84-19717 #

OAI-1512-11-83 N84-19472* #

OEHL-83-298EH374JGA N84-20032 #

ORNL/SUB-78-7229/4 N84-19611 #
ORNL/SUB-80-13836/1-02 N84-19821 #

OSD/FSTC-82/335 N84-20206 #
OSD/FSTC-83/140 N84-20256 #
OSD/FSTC-83/230 N84-20257 #
OSD/FSTC-83/270 N84-20204 #
OSD/FSTC-83/271 N84-20205 #

OUEL-1493/83 N84-20263 #

OWRT-A-032-WYO(1) N84-20039 #
OWRT-A-113-WASH(1) N84-20007 #

PATR-1109-83-12 N84-20159 #

PB84-100668 N84-20078 #
PB84-104314 N84-20112 #
PB84-115997 N84-20035 #
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PB84-132075 N84-20005 #
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PB84-140235 N84-20257 #

PML-1983-114 N84-19780 #

PNL-SA-111743 N84-19612 #

PNL-4849 N84-20019 #

POLY-M/AE-83-4 N84-20342 #

PPSP/JHU/PPSE-T-23 N84-19619 #

PR-2 N84-19966* #
PR-4 N84-19751 #

PREPRINT-604 N84-19302 #

PTB-ME-47 N84-19800 #

PWA-5896-21 N84-19353* #

PWA/GPD-FR-17404-VOL-1 N84-19597 #
PWA/GPD-FR-17404-VOL-2 N84-19598 #

QR-5 N84-19771 #

QTPR-2 N84-19368* #
QTPR-14 N84-19720 #

QTR-8 N84-20409 #

R-49 N84-20007 #
R-446 N84-19941 #

RAC-TR-83-09-E01 N84-19713 #

RADC-TR-83-217-VOL-1 N84-19669 #
RADC-TR-83-217-VOL-2 N84-19670 #
RADC-TR-83-217-VOL-3 N84-19671 #
RADC-TR-83-217-VOL-3-PT-3 N84-19673 #
RADC-TR-83-217-VOL-3-PT-4 N84-19674 #

RAE-TR-83018 N84-19473 #

RANRL-TM(EXT)-4/83 N84-19994 #

RCC/MG-370-83 N84-20421 #

RD-1-84 N84-19389* #

REPT-I-4/241/720/83.063 N84-19593 #

REPT-OF-INVESTIGATIONS-132 N84-19996 #

REPT-S-142 N84-20301 #

REPT-2-6-ONR N84-19497 #
REPT-5/1982 N84-19316
REPT-22 N84-19517 #
REPT-83-9C9-TUDEV-R1 N84-20411 #
REPT-84-6 N84-19282* #
REPT-84F5215 N84-20208* #
REPT-475 N84-19352 #
REPT-980 N84-20457* #
REPT-1080-PT-3-VOL-2-31 N84-20240 #
REPT-2002 N84-20157 #
REPT-18401 N84-20015* #

RISOE-R-483 N84-20090 #

RMCS-TR-D/R/2 ..... N84-19525 #
RR-83-1 ..... N84-20280 #
RSD-TR-17-83 ..... N84-20191 #
RSRE-83009 ..... N84-20239 #
RUB-IFM-MITT-33-PT-1 ..... N84-19740
R83-910002-F ..... N84-19763 #
S-REPT-98-585 ..... N84-19605 #
SACLANTCEN-SR-74 ..... N84-20088 #
SAI-84-982-WA ..... N84-20321 #
SAM-TR-83-44 ..... N84-20141 #
SAND-83-1376C ..... N84-19837 #
SAND-83-2540C ..... N84-19809 #
SAR-3 ..... N84-19525 #
SATR-3 ..... N84-19496 #
SC5202.23FR ..... N84-20407 #
SC5344.7FR ..... N84-20405 #
SD-TR-83-70 ..... N84-20451 #
SD83-BMDSCOM-2682 ..... N84-19677 #
SER-B-265 ..... N84-19942
SER-C-278-MITT-163 ..... N84-19998 #
SERI/PR-255-2148 ..... N84-20022 #
SERI/STR-211-2086 ..... N84-19688 #
SEVILLE-TR-82-06 ..... N84-20160 #
SIO-REF-83-15 ..... N84-20010 #
SM-L1-04209 ..... N84-19961* #
SOCIAL-PSYCHOLOGY-BULL-83-2 ..... N84-20282 #
SOM-TR-2 ..... N84-20165 #
SOM-WP-57 ..... N84-20167 #
SR-83-04444 ..... N84-19953* #
SRI-MP-83-196 ..... N84-19496 #
SSS-R-84-6386 ..... N84-19772 #
STI/E-TR-9109 ..... N84-19368* #
STI/E-TR-25066-VOL-1 ..... N84-19369* #
STI/E-TR-25066-VOL-2 ..... N84-19370* #
STI/E-TR-25066-VOL-3 ..... N84-19371* #
STI/E-TR-25066-VOL-4 ..... N84-19372* #
STI/E-TR-25066-VOL-5 ..... N84-19373* #
STI/E-TR-25066-VOL-6 ..... N84-19374* #
STI/E-TR-25066-VOL-7 ..... N84-19375* #
STI/E-TR-25066-VOL-8 ..... N84-19376* #
SU-TR-211 ..... N84-20310 #
SVHSER-8921 ..... N84-20177* #
SVIC-BULL-53-PT-1 ..... N84-19866 #
SVIC-BULL-53-PT-2 ..... N84-19881 #
SVIC-BULL-53-PT-3 ..... N84-19893 #
SVIC-BULL-53-PT-4 ..... N84-19908 #
SWRI-06-4231 ..... N84-19529 #
SWRI-6077/1 ..... N84-19584 #
SWRI-6800-210/1 ..... N84-19817 #
TELAC-83-11 ..... N84-19486 #
TM-4 ..... N84-19502 #
TN-361 ..... N84-20005 #
TR-AP83-044 ..... N84-20465* #
TR-ONR-7 ..... N84-20186 #
TR-1 ..... N84-20406 #
TR-2-ONR ..... N84-20185 #
TR-4 ..... N84-19571 #
TR-5 ..... N84-19589 #
TR-6 ..... N84-19570 #
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TR-40 ..... N84-19501 #
TR-53 ..... N84-19930 #
TR-83-6 ..... N84-20157 #
TR-83-22-ONR ..... N84-20142 #
TR-113-13 ..... N84-20236 #
TR-118B-6183 ..... N84-20141 #
TR-130 ..... N84-20280 #
TR-639 ..... N84-19661 #
TR-641 ..... N84-19664 #
TR-663 ..... N84-19678 #
TR-674 ..... N84-20279 #
TR-0084(4925-07)-2 ..... N84-20451 #
TR/ONR-10 ..... N84-20282 #
TUM-LRT-TB-7 ..... N84-19470* #
TUM-LRT-TB-10 ..... N84-19471* #
U-OF-IOWA-83-5 ..... N84-20069 #
UCB/ERL-M83/39 ..... N84-20288 #
UCB/ERL-M83/45 ..... N84-20311 #
UCB/ERL-M83/52 ..... N84-20388 #
UCB/ERL-M83/57 ..... N84-20287 #
UCB/ERL-M83/61 ..... N84-20389 #
UCID-17530-REV-3 ..... N84-20318 #
UCID-19925 ..... N84-19687 #
UCID-19947 ..... N84-20248 #
UCID-19948 ..... N84-19812 #
UCID-19960 ..... N84-20324 #
UCID-30197 ..... N84-20252 #
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UCRL-15567 ..... N84-19772 #
UCRL-89430 ..... N84-19797 #
UCRL-89914 ..... N84-20458 #
UCRL-89979 ..... N84-20319 #
UCRL-90099 ..... N84-20253 #
UCRL-90109 ..... N84-20398 #
UIEM-83-7 ..... N84-19660 #
UILU-ENG-83-2546 ..... N84-19660 #
UMD-DMSS-84/1 ..... N84-20293 #
UROCHESTER/DC/84/TR-47 ..... N84-19504 #
USAAVRADCOM-83E-10 ..... N84-19681 #
USAAVRADCOM-83E-13 ..... N84-19679 #
USAAVSCOM-TR-84-B-1 ..... N84-19565* #
USARIEM-M-6/84 ..... N84-20146 #
USARIEM-T-7/83 ..... N84-20140 #
USGS-CIRC-910 ..... N84-20029 #
USGS-OFR-83-616 ..... N84-19995 #
USGS-OPEN-FILE-83-568 ..... N84-19985 #
USGS-WRD-NY-82/3 ..... N84-20003 #
USGS/WDR/IA-82/1 ..... N84-20009 #
USGS/WDR/ND-82/1 ..... N84-20008 #
USGS/WDR/TX-82/1 ..... N84-20006 #
USGS/WRD-83/077 ..... N84-20009 #
USGS/WRD/CO-82/2 ..... N84-20004 #
USGS/WRD/HD-82/053 ..... N84-20004 #
USGS/WRD/HD-82/081 ..... N84-20008 #
USGS/WRD/HD-83/038 ..... N84-20003 #
USGS/WRD/HD-83/060 ..... N84-20006 #
UTRC/R83-915712-2 ..... N84-19298 #
UVA/528219/EE84/102 ..... N84-19360* #
UVA/528228/MAE84/101 ..... N84-19283* #
VI-697 ..... N84-20042* #
VKI-CR-1983-05 ..... N84-19765 #
VTH-LR-336 ..... N84-19304 #
VTH-LR-357-PT-1 ..... N84-19938 #
VTH-LR-364 ..... N84-20302 #
VTH-LR-368 ..... N84-19939 #
VTH-LR-369 ..... N84-19305 #
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VTH-LR-381 ..... N84-19561 #
VTH-LR-383 ..... N84-19780 #
VTH-LR-384-PT-1 ..... N84-19357 #
VTH-LR-384-PT-2 ..... N84-19358 #
VTH-LR-385-VOL-1 ..... N84-19345 #
VTH-LR-385-VOL-2 ..... N84-19346 #
VTH-LR-385-VOL-3 ..... N84-19347 #
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